Dr. MAHALINGAM
MCET
COLLEGE OF ENGINEERING AND TECHNOLOGY
Enlightening Technical Minds Estd. 1998
An Autonomous Institution
(Since 2011)

Dr. MAHALINGAM
COLLEGE OF ENGINEERING AND TECHNOLOGY
Affiliated to Anna University, Chennai; Approved by AICTE ; Accredited by NAAC with Grade 'A++'
Accredited by NBA - Tier1 (Mech, Auto, Civil, EEE, ECE, E&I and CSE)
Udumalai Road, Pollachi - 642 003 Tel: 04259-236030/40/50 Fax: 04259-236070 www.mcet.in

Curriculum and Syllabi

B.E. Electrical and Electronics Engineering

Semesters I to IV

Regulations 2019

Dr. Mahalingam College of Engineering and Technology, Pollachi – 642003.
(An autonomous institution approved by AICTE and affiliated to Anna University)

Department of Electrical & Electronics Engineering

Vision

We develop globally competent Electrical and Electronics Engineer to solve real time problems of the industry and society and conduct research for the application of knowledge to the society

Mission

In order to foster growth and empowerment, we commit ourselves to

- Develop electrical and electronics engineers of high caliber to meet the expectations of industries through effective teaching-learning process
- Improve career opportunities in core areas of electrical and electronics engineering.
- Inculcate leadership qualities with ethical and social responsibilities

OBE Coordinator

Programme Coordinator

Head of the Department

Head - OBE

Dr. Mahalingam College of Engineering and Technology, Pollachi – 642003.
(An autonomous institution approved by AICTE and affiliated to Anna University)

Programme: B.E. Electrical & Electronics Engineering

Programme Educational Objectives (PEOs) - Regulation 2019

B.E. Electrical and Electronics Engineering graduates will:

PEO1.Technical Expertise: Acquire a professional career and personal development in industries / higher studies / research assignments / entrepreneurs.

PEO2.Life-long learning: Sustain to develop their knowledge and skills throughout their career.

PEO3. Ethical Knowledge: Exhibit professionalism, ethical attitude, communication skills, team work and adapt to Current trends.

Programme Outcomes (POs) - Regulations 2019

On successful completion of B.E. Electrical and Electronics Engineering programme, graduating students/graduates will be able to:

PO1. Engineering knowledge:Apply the knowledge of **mathematics, science, fundamentalelectrical and electronics engineering** to the **solution of complex engineering problems**.

PO2. Problem analysis:Identify, formulate, review research literature, and **analyze complex engineering problems** reaching substantiated **conclusions using first principles** of mathematics, natural sciences, electrical and electronics engineering.

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

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

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

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

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

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

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

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to **comprehend** and **write effective reports** and design documentation, **make effective presentations,** and give and **receive clear instructions.**

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and **apply** these to one's own work, as a member and leader in a team, **to manage projects and in multidisciplinary environments.**

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

Programme Specific Outcomes (PSOs) - Regulations 2019

On successful completion of the programme, graduates will be able to:

PSO 1.Design and analyze systems associated with industrial control, power and automotive industries.

PSO 2. Develop products to cater the societal and industrial needs **considering recent technological developments** in Electrical & Electronics Engineering.

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Programme: B.E Electrical and Electronics Engineering
2019 Regulations
Curriculum for Semesters I to II

Course Code	Course Title	Duration	Credits	Marks
19SHMG6101	Induction Program	3 Weeks	-	100

Semester I (2019 Batch)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1101	Matrices and Calculus	3	1	0	4	100	AU,CE,EC,EE, EI,ME & MC
19ENHG2101	Communication Skills – I	2	0	2	3	100	All
19PHBC2001	Physics for Electrical Sciences	3	0	2	4	100	EC,EE &EI
19MESC2001	Introduction to Engineering	2	0	2	3	100	AU,EC,EE,EI, ME& MC
19MESN4101	Engineering Graphics	1	0	3	2.5	100	-
19PSHG3001	Wellness For Students	0	0	2	1	100	All
Total		**11**	**1**	**11**	**17.5**	**600**	

Semester II (2019 Batch)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19ENHG2201	Communication Skills - II	2	0	2	3	100	All
19MABC1201	Ordinary Differential Equations and Complex Variables	3	1	0	4	100	AU,CE,EC,EE , EI,ME&MC
19CHBC2001	Chemistry for Electrical Sciences	3	0	2	4	100	EC,EE&EI
19EESN2201	Electron Devices	3	0	2	4	100	-
19CSSC2001	C Programming	3	0	2	4	100	AU,CE,EC,EE EI,ME&MC
19EECN4201	Electrical CAD	1	0	3	2.5	100	-
19PSHG3002	Personal Effectiveness	0	0	2	1	100	All
19CHMG6201	Environmental Sciences	1	0	0	-	100	All
Total		**16**	**1**	**13**	**22.5**	**800**	

Passed in Board of Studies meeting

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BOS Chairman

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Programme: B.E Electrical and Electronics Engineering
2019 Regulations
Curriculum for Semesters I to IV

Course Code	Course Title	Duration	Credits	Marks
19SHMG6101	Induction Program	3 Weeks	-	100

Semester I (2020 Batch)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1101	Matrices and Calculus	3	1	0	4	100	AU,CE,EC,EE, EI,ME & MC
19ENHG2101	Communication Skills – I	2	0	2	3	100	All
19CHBC2001	Chemistry for Electrical Sciences	3	0	2	4	100	EC,EE &EI
19MESC2001	Introduction to Engineering	2	0	2	3	100	AU,EC,EE,EI, ME& MC
19MESN4101	Engineering Graphics	1	0	3	2.5	100	-
19PSHG6001	Wellness for Students*	0	0	2	-	-	All
Total		**11**	**1**	**11**	**16.5**	**500**	

Semester II (2020 Batch)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19ENHG2201	Communication Skills - II	2	0	2	3	100	All
19MABC1201	Ordinary Differential Equations and Complex Variables	3	1	0	4	100	AU,CE,EC,EE EI,ME&MC
19PHBC2001	Physics for Electrical Sciences	3	0	2	4	100	EC,EE &EI
19EESN2201	Electron Devices	3	0	2	4	100	-
19CSSC2001	C Programming	3	0	2	4	100	AU,CE,EC,EE EI,ME&MC
19EECN4201	Electrical CAD	1	0	3	2.5	100	-
19PSHG6001	Wellness for Students*	0	0	2	1	100	All
19CHMG6201	Environmental Sciences	1	0	0	-	100	All
Total		**16**	**1**	**13**	**22.5**	**800**	

* Annual Pattern

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Dr. Mahalingam College of Engineering and Technology
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Semester III

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1302	Numerical Methods and Linear Algebra	3	1	0	4	100	EC,EE,EI
19EECN1301	DC Machines and Transformers	3	0	0	3	100	-
19EECN1302	Electric Circuits	3	1	0	4	100	-
19EECC2301	Digital Electronics	3	0	2	4	100	EE,EI
19EECN2301	Instrumentation and Testing	3	0	2	4	100	-
19EECN3301	DC Machines and Transformers Laboratory	0	0	3	1.5	100	-
19EECN4301	Process Engineering in Electrical & Electronic Parts	1	0	3	2.5	100	-
XXXXXXXXX	One Credit Course	0	0	2	1	100	-
19PSHG6002	Universal Human Values 2 :Understanding Harmony	2	1	0	3	100	All
Total		**18**	**3**	**12**	**27**	**900**	

Semester IV

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABG1401	Probability and Statistics	3	1	0	4	100	All
19EECN1401	Synchronous and Induction Machines	3	0	0	3	100	-
19EECN2401	Electronic Circuits	3	0	2	4	100	-
19CSSC2401	Data Structures and Algorithms	2	0	2	3	100	EE,EI
19EECN3401	Synchronous and Induction Machines Laboratory	0	0	3	1.5	100	-
19EESN4401	Process Engineering in Mechanical Part Assembly	1	0	3	2.5	100	-
XXXXXXXXX	One Credit Course	0	0	2	1	100	-
19EEPN6401	Mini-Project	0	0	4	2	100	All
Total		**12**	**1**	**16**	**21**	**800**	-

Course Code	Course Title	Duration	Credits	Marks
19EEPN6001	Internship or Skill Development*	2 Weeks	1	100

*Refer to clause: 4.8 in UG academic regulations 2019

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Tentative Curriculum for Semesters V to VIII

Semester V

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Generation, Transmission and Distribution	3	0	0	3	100	-
	Internet of Things	2	0	2	4	100	-
	Networks and Signals	3	1	0	4	100	-
	Linear Integrated Circuits	3	0	0	3	100	-
	Professional Elective – I	3	0	0	3	100	-
	Open Elective – I	3	0	0	3	100	-
	Online Course - I	3	0	0	3	100	-
	Integrated Circuits Laboratory	0	0	3	1.5	100	-
	Employability Skills	0	0	2	1	100	
Total		**20**	**1**	**7**	**25.5**	**900**	**-**

Semester VI

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Power Electronics	3	0	0	3	100	-
	Control Systems	3	0	2	4	100	-
	Microprocessor and Microcontroller	3	0	2	4	100	-
	Professional Elective – II	3	0	0	3	100	-
	Open Elective – II	3	0	0	3	100	-
	Online Course - II	3	0	0	3	100	-
	Power Electronics Laboratory	0	0	3	1.5	100	-
	Innovative and Creative Project	0	0	4	2	100	-
	Career Planning and Guidance	0	0	2	1	100	-
Total		**18**	**0**	**13**	**24.5**	**900**	**-**

Course Code	Course Title	Duration	Credits	Marks
	Internship or Skill Development*	2 or 4 Weeks	1	100

*Refer to clause: 4.8 in UG academic regulations 2019

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Semester VII

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Power System Analysis and Stability	3	0	2	4	100	-
	Electric Drives and Control	3	0	2	4	100	-
	Professional Elective – III	3	0	0	3	100	-
	Open Elective – III	3	0	0	3	100	-
	Power System Simulation Lab	0	0	2	1	100	
Total		**12**	**0**	**6**	**15**	**500**	-

Semester VIII

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Project	0	0	16	8	200	-
Total		**0**	**0**	**16**	**8**	**200**	-

Course Code	Course Title	Duration	Credits	Marks
	Internship or Skill Development*	8 or 16 weeks	4	100

*Refer to clause: 4.8 in UG academic regulations 2019

Total Credits (2019 Batch only): 167

Total Credits (2020 Batch onwards): 166

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HOD-Electrical and Electronics Engineering
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Professional Electives

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
Power Engineering							
	Protection and Switchgear	3	0	0	3	100	-
	Power System Operation and Control	3	0	0	3	100	-
	Smart Grid	3	0	0	3	100	-
	HVDC Transmission	3	0	0	3	100	-
	FACTS	3	0	0	3	100	-
	Electrical Distribution System	3	0	0	3	100	-
	Advanced Power System Protection	3	0	0	3	100	-
	Power System Stability	3	0	0	3	100	-
	Power System Reliability	3	0	0	3	100	-
	Grid Distribution Generation and Micro Grid	3	0	0	3	100	-
	Power System Components And Modelling	3	0	0	3	100	-
	Wind And Solar Energy	2	0	2	3	100	-
	Transient in Power System	3	0	0	3	100	-
	Power Quality	3	0	0	3	100	-
	EHAC Power Transmission	3	0	0	3	100	-
	Deregulated Power System	3	0	0	3	100	-
	Energy Auditing And Conservation	3	0	0	3	100	-
	Advanced Power System Analysis	3	0	0	3	100	-
Industrial Engineering							
	UPS & SMPS	3	0	0	3	100	-
	Industrial Automation	2	0	2	3	100	-
	Industrial Communication Networks	3	0	0	3	100	-
	Special Machines Drives	3	0	0	3	100	-
	Industry 4.0	3	0	0	3	100	-
	Solar & Wind Energy Conversion System	2	0	2	3	100	-
	Battery Systems	3	0	0	3	100	-
	Illumination Engineering	3	0	0	3	100	-
	Industrial Safety	3	0	0	3	100	-
	Embedded System	2	0	2	3	100	
	Communication	3	0	0	3	100	-
	Digital Signal Processing	2	2	0	3	100	-

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Automotive Engineering							
	Automotive Engineering	3	0	0	3	100	-
	Automotive Embedded System	3	0	0	3	100	-
	In -Vehicle Networking	3	0	0	3	100	-
	Automotive Sensors & Actuators	2	0	2	3	100	-
	Battery & Charging Management System	3	0	0	3	100	-
	Electric Vehicle	3	0	0	3	100	-
	Hybrid Vehicle	3	0	0	3	100	-
	Autonomous Vehicle	3	0	0	3	100	-
	Telematics	3	0	0	3	100	-
	Vehicle Testing	3	0	0	3	100	-
	Systems Approach For Engineers	3	0	0	3	100	-
General Engineering							
	Virtual Instrumentation	2	0	2	3	100	-
	Big Data Analytics	3	0	0	3	100	-
	Machine Learning	3	0	0	3	100	-
	Cloud Computing	3	0	0	3	100	-
	Artificial Intelligence	3	0	0	3	100	-
	.NET	2	0	2	3	100	-
	Java Programming	2	0	2	3	100	-
	Python Programming	2	0	2	3	100	-
	PHP Programming	2	0	2	3	100	-
	VLSI Design	2	0	2	3	100	-
	Hardware Description language	2	0	2	3	100	-
	Image Processing	2	0	2	3	100	-
	New Product Development	3	0	0	3	100	-
	Project Management	3	0	0	3	100	-
	Software Engineering Process Management	3	0	0	3	100	-
	Failure Modes and Effects Analysis	3	0	0	3	100	-
	Quality Engineering	3	0	0	3	100	-
	Reliability Engineering	3	0	0	3	100	-
	System Modelling & Simulation	2	0	2	3	100	-
	Object Oriented Programming	3	0	0	3	100	-
	Cyber physics and Cyber security	3	0	0	3	100	-

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Open Electives

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
	Electric Hybrid vehicle	3	0	0	3	100
	Solar Energy system	3	0	0	3	100
	Energy Auditing and Conservation	3	0	0	3	100

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Dr. Mahalingam College of Engineering and Technology

Regulations 2019

Detailed Syllabi for Semesters I to IV

Semester I

Course Code: 19SHMG6101	Course Title: Induction Program (common to all B.E/B.Techprogrammes)
Course Category: Mandatory Non-Credit Course	Course Level: Introductory
Duration: 3 Weeks	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain various sources available to meet the needs of self, such as personal items and learning resources
2. Explain various career opportunities, opportunity for growth of self and avenues available in the campus
3. Explain the opportunity available for professional development
4. Build universal human values and bonding amongst all the inmates of the campus and society

List of Activities:

1. History of Institution and Management: Overview on NIA Education Institutions-Growth of MCET – Examination Process-OBE Practices – Code of Conduct – Centre of Excellence
2. Lectures by Eminent People, Motivational Talk – Alumni, Employer
3. Familiarization to Dept./Branch: HoD Interaction – Senior Interaction – Department Association
4. Universal Human Value Modules: Module 1, Module 2,Module 3 and Module 4
5. Orientation on Professional Skill Courses
6. Proficiency Modules – Mathematics, English, Physics and Chemistry
7. Introduction to various Chapters, Cell, Clubs and its events
8. Creative Arts: Painting, Music and Dance
9. Physical Activity: Games and Sports, Yoga and Gardening
10. Group Visits: Visit to Local areas and Campus Tour

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Dr. Mahalingam College of Engineering and Technology
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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain various sources available to meet the needs of self, such as personal items and learning resources through visit to local areas and campus	Understand
CO2: Explain various career opportunities and avenues available in the campus through orientation sessions	Understand
CO3: Explain the opportunity available for professional development through professional skills, curricular, co-curricular and extracurricular activities	Understand
CO4: Build universal human values and bonding amongst all the inmates of the campus and society for having a better life	Apply

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO2	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO3	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO4	2	-	-	-	-	-	-	2	1	2	-	-	-	-

High-3; Medium-2;Low-1

Assessment Pattern

Component	Marks	Details
Attendance	10	Minimum 80% and 1 mark for every 2% observed
Knowledge Test	40	Objective type questions
Work plan for future	50	Career plan developed consulting mentor
Total	**100**	

Non-letter Grades

Marks Scored	Performance Level
70 & above	Good
30 – 69	Average
< 30	Fair

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Course Code:19MABC1101		Course Title:Matrices and Calculus (Common to AU,CE ,EC,EE ,EI,ME and MC)	
CourseCategory:Basic Science		CourseLevel: Introductory	
L:T:P(Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Determine the canonical form of a Quadratic form using Orthogonal transformation
2. Use different testing methods to check the convergence of infinite series
3. Apply differential and integral calculus to determine the evoluteof a curve and improper integrals
4. Apply partial derivatives to find extreme values of functions of two variables
5. Apply multiple integrals to find area of plane curves and volume of solids

Unit I Matrices **9+3 Hours**

Rank of a matrix - System of linear equations – Symmetric - Skew symmetric and orthogonal matrices-(Definitions and examples only) – Eigenvalues and Eigenvectors - Diagonalization of symmetric matrices through orthogonal transformation – Cayley-Hamilton Theorem - Transformation of quadratic forms to canonical forms through orthogonal transformation.

Unit II Sequences and Series **9+3Hours**

Sequences - Definition and Examples - Series- Tests for convergence- Power series - series for exponential, trigonometric and logarithm functions - Comparison Test – Integral Test - Cauchy's root test - D Alembert's ratio test - Alternating series- Leibnitz's test.

Unit III Differential and Integral Calculus **9+3Hours**

Curvature – Radius of curvature - Evolutes and Involutes - Evaluation of definite and improper integrals - Beta and Gamma functions and their properties.

Unit IV Multivariable Differentiation **9+3Hours**

Limit – continuity - Mean value theorems and partial derivatives-Taylor's series and Maclaurin's series – Jacobian – Maxima, Minima and saddle points - Method of Lagrange's multipliers.

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Unit V **Multivariable Integration** **9+3 Hours**

Multiple Integration: Double integrals - Change of order of integration in double integrals - Change of variables (Cartesian to polar, Cartesian to spherical and Cartesian to cylindrical) - Triple integrals - Applications: areas and volumes.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Determine the canonical form of a Quadratic form using Orthogonal transformation	Apply
CO2: Use different testing methods to check the convergence of infinite series	Apply
CO3: Determine the evolute of a curve and evaluate improper integrals using beta gamma functions	Apply
CO4: Apply partial derivatives to find extreme values of functions of two variables	Apply
CO5: Apply multiple integrals to find area of plane curves and volume of solids	Apply

Text Book(s):

T1. Erwinkreyzig, Advanced Engineering Mathematics, 9th Edition, John Wiley& Sons, 2006.

T2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi, 2008.

T3. Ramana B.V., higher Engineering Mathematics, Tata McGraw-Hill, New Delhi, 11th Reprint, 2010.

Reference Book(s):

R1. G.B.Thomas and R.L Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2002.

R2. N.P.Bali and Manish Goyel, A text book of Engineering Mathematics, Laxmi Publication, Reprint, 2008.

R3. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Web References:

1.https://onlinecourses.nptel.ac.in/noc16_ma05

2.https://nptel.ac.in/courses/122101003/2

3.https://nptel.ac.in/syllabus/111104092/

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Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	2	2	3	-	2	-	-
CO2	3	-	-	-	-	-	-	2	2	3	-	2	-	-
CO3	3	-	-	-	-	-	-	2	2	3	-	2	-	-
CO4	3	-	-	-	-	-	-	2	2	3	-	2	-	-
CO5	3	-	-	-	-	-	-	2	2	3	-	2	-	-

High-3; Medium-2;Low-1

Assessment Pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	Tutorial/ Quiz/ Assignment	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Passed in Board of Studies meeting

BOS Convener

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BOS Chairman

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Course Code:19ENHG2101		Course Title:Communication Skills – I (Common to all B.E/B.TechProgrammes)	
CourseCategory: Humanities		CourseLevel: Introductory	
L:T:P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max Marks:100

Pre-requisites

- The student should have undergone English as his/her first or second language in school.

Course Objectives

The course is intended to:

1. Listen and understand monologues and dialogues of a native speaker on par with B1 of CEFR level
2. Speak in simple sentences to convey their opinions and ideas on par with B1 of CEFR level
3. Read and infer a given text on par with B1 of CEFR level
4. Draft basic formal written communication on par with B1 of CEFR level

Unit I Listening **15 Hours**

Importance of active listening –Physical condition needed for active listening-Identifying relevant points while taking notes.- Framing questions at different linguistic contexts - Listening for specific details of concrete monologues and dialogues –Listening to organize ideas - Developing ideas –Listening to compose paragraphs – Paraphrasing the aural input.

Unit II Speaking **15 Hours**

Importance of note making to practice speaking - Traditional note making, developing Mind map - Collecting points from various sources - Identifying relevant ideas needed for the speech -Using mind-map to organize thought processing - Prioritizing the ideas - Types of sentences - Frequently used words (Institution, home and leisure) - Mother Tongue Influence - Expressing the thoughts in simple sentences - Tenses & Voices (Active & Passive) - Postures, gestures and eye contact - Intonation and Sentence stress - Express one's thoughts coherently.

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Unit III Reading **15 Hours**

Reading strategies - Skimming -Scanning - Interpretation of visual data - Factual texts on subjects of relevance - Inferring texts –Reading to write a review –Checking the accuracy of reading while presenting the interpreted data – Reading to comprehend.

Unit IV Writing **15 Hours**

WritingSimple and short sentences - Writing E-mail, Memo, Note and Message - Letter Writing - Importance of punctuations -- Identifying the main points - Organising the main ideas - Writing a draft.

List of Tasks

1. BEC Preliminary Listening Test – I & Speaking Test – 1
2. BEC Preliminary Listening Test – 2 & Speaking Test – 2
3. BEC Preliminary Listening Test – 3 & Speaking Test – 3
4. BEC Preliminary Listening Test – 4 & Speaking Test – 4
5. BEC Preliminary Listening Test – 5 & Speaking Test – 5
6. BEC Preliminary Listening Test – 6 & Speaking Test – 6

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Listen actively and paraphrase simple messages and specific details of concrete monologues and dialogues	Apply
CO2: Express one's views coherently in a simple manner	Apply
CO3: Read and comprehend factual texts on subjects of relevance	Understand
CO4: Write texts bearing direct meanings for different contexts maintaining an appropriate style	Apply

Text Book(s):

T1. Whitby Norman, Business Benchmark Pre-intermediate to Intermediate Students' Book CUP Publications, 2nd Edition, 2014.

T2. Wood Ian, Williams Anne, Cowper Anna, Pass Cambridge BEC Preliminary, Cengage Learning,2nd Edition, 2015.

T3. Learners Book prepared by the Faculty members of Department of English.

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Reference Book(s):

R1. BEC-Preliminary - Cambridge Handbook for Language Teachers, 2nd Edition, CUP 2000.

R2. Hewings Martin - Advanced Grammar in use - Upper-intermediate Proficiency, CUP, 3rd Edition, 2013.

Web References:

1. http://www.grammarinenglish.com -Jan 23,2018
2. https://www.northshore.edu/support_centre /pdf/listen-notes.pdf
3. http://www.examenglish.com/BEC/BEC_Vantage.html- Jan 23, 2018

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	2	3	-	-	-	-
CO2	2	-	-	-	-	-	-	1	2	3	-	-	-	-
CO3	1	-	-	-	-	-	-	1	-	3	-	-	-	-
CO4	2	-	-	-	-	-	-	1	-	3	-	-	-	-

High-3; Medium-2;Low-1

Assessmentpattern:

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	2,3,4	50	20
	CCET II	2,3,4	50	
	CCET III	2,3,4	50	
	Continuous Assessment – Practical	1,2	75	10
	Final Assessment – Practical	1,2	50	10
End Semester Examination	ESE	2,3,4	100	60
			Total	100

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HOD-Electrical and Electronics Engineering
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Pollachi - 642 003.

Course Code:19CHBC2001	Course Title: Chemistry for Electrical Sciences (Common to EC,EE and EI) (2020 Batch onwards)		
CourseCategory: Basic Science		CourseLevel: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Pre-requisites

- Higher Secondary Chemistry I and II

Course Objectives

The course is intended to:

1. Explain the principles of electrochemistry and batteries
2. Explain the mechanism of corrosion and corrosion control
3. Explainthe concepts of spectroscopic techniques
4. Describe the basics of biofuels and fuel cells
5. Describe synthesis, properties and applications of nano-materials

Unit I Electrochemistry and Batteries **9 Hours**

Cells – Types of cells– galvanic and electrolytic cells – emf and its measurement – Nernst equation –Batteries – types and Characteristics, Construction, working and applications - Alkaline battery, Lead –Acid battery, Nickel-Cadmium battery, Lithium ion battery

Unit II Corrosion and its Control **9 Hours**

Corrosion – dry and wet corrosion – mechanism of electrochemical corrosion – galvanic corrosion and concentration cell corrosion, Factors influencing corrosion. Corrosion Control methods – Cathodic protection methods, Metallic coating – Galvanizing, Tinning – Chrome plating and Electroless plating of Nickel

Unit III Spectroscopic Techniques **9 Hours**

Spectroscopy- Electromagnetic spectrum, Absorption and Emission spectroscopy – Relationship between absorbance and concentration – Derivation of Beer-Lambert's law (problems). UV – Visible Spectroscopy, Atomic Absorption Spectroscopy, Flame photometry – Principle, Instrumentation and applications.

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Unit IV Biofuels and Fuel Cells **9 Hours**

Biomass – Biogas – Constituents, manufacture and uses. General outline of fermentation process – manufacture of ethyl alcohol by fermentation process. Combustion – Calorific values – Gross and bet calorific value – problems based on calorific value. Fuel cells – Construction working and applications of Hydrogen Oxygen fuel cells, methanol oxygen fuel cells, solid oxide fuel cells

Unit V Synthesis and Applications of Nano Materials **9 Hours**

Introduction – Difference between bulk and Nano materials – size dependent properties. Nano scale materials –particles, clusters, rods and tubes. Synthesis of Nanomaterials: Sol-gel process, Electro deposition, Hydrothermal methods. Applications of Nano materials in Electronics, Energy science and medicines. Risk and future perspectives of nano materials.

List of Experiments **30 Hours**

1. Estimation of iron in water by spectrophotometry
2. Estimation of Fe^{2+} by potentiometric titration
3. Determination of corrosion rate by weight loss method
4. Measurement of emf of electrochemical cell – Poggendorff's method
5. Determination strength of acid by pHmetry
6. Conductometric titration of strong acid against strong base

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explainbatteries based on their characteristics, construction, working principle and applications	Understand
CO2: Explain the mechanism of corrosion and its control techniques	Understand
CO3: Use Beer- Lambert's law and other spectroscopic methods for chemical analysis	Apply
CO4: Calculate energy potential of fuel cells and calorific value of biofuels	Apply
CO5: Describe synthesis, properties and applications of nano-materials	Understand

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Text Book(s):

T1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition.,DhanpatRai Pub, Co., New Delhi (2018).

T2. Wiley Engineering Chemistry, Second Edition, Wiley India Pvt. Ltd. New Delhi (2011).

Reference Book(s):

R1. S. S. Dara, S. S. Umare "A text book of Engineering Chemistry" 12thEdition S. Chand & Co. Ltd., New Delhi (2014).

R2. Charles P. Poole, Jr., Frank J. Owens "Introduction to Nanotechnology" Wiley India Pvt. Ltd. New Delhi (2003)

Web References:

1. http://nptel.ac.in/courses/122101001/downloads/lec.23.pdf
2. https://nptel.ac.in/courses/104106075/Week1/MODULE%201.pdf
3. https://nptel.ac.in/courses/103102015/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO2	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO3	2	-	-	-	-	-	-	1	2	3	-	-	-	-
CO4	2	-	-	-	-	-	-	1	-	1	-	-	-	-
CO5	1	-	-	-	-	-	-	1	-	1	-	-	-	-

High-3; Medium-2;Low-1

Assessment pattern:

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment -- Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code:19PHBC2001		Course Title:Physics for Electrical Sciences (Common to EC,EE,EI) (2019 Batch only)	
Course Category: Basic Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain the concepts of static electric field
2. Explain the concepts of static magnetic field
3. Explain the behavior of materials in electric and magnetic fields
4. Explain electric and magnetic fields using Maxwell's equation
5. Explain the phenomenon of Electromagnetic wave propagation

Unit I Electrostatics **9 Hours**

Definition of electric charge-Coulomb's Law – Electric field intensity – Field intensity due to point and line charges – Electric flux density -Gauss's law- Application of Gauss's law: Due to a line charge and a plane sheet of charge – Electric potential-Equipotential surfaces-Potential gradient.

Unit II Magnetostatics **9 Hours**

Definition of magnetic flux- magnetic field intensity-Lorentz Law of force- Biot –savart Law, Ampere's Law- Application of Ampere's Law: Magnetic induction due to a long linear conductor and solenoid - Magnetic field due to straight conductors- circular loop – Magnetic flux density (B) - Magnetic potential.

Unit III Electric and Magnetic Fields in materials **9 Hours**

Dielectrics: An atomic view - Dielectric Polarization- Dielectrics and Gauss's law- Dielectric Strength- Energy stored in a dielectric medium - Capacity of a condenser - Capacitance - coaxial, Spherical capacitor- Poisson and Laplace Equation.

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Magnetic susceptibility and permeability- properties of dia, para and ferro magnetic materials- hysteresis loop.

Unit IV Electromagnetic Induction **9 Hours**

Faraday's law – Lenz's law – Time varying magnetic field - self Inductance - self Inductance of a solenoid- Mutual inductance- Mutual inductance of two solenoids. Charge conservation law - continuity equation- displacement current- Maxwell's equations.

Unit V Electromagnetic Waves **9 Hours**

Electromagnetic waves in free space - Poynting vector - Propagation of electromagnetic waves in dielectrics – Phase velocity- Propagation of electromagnetic waves through conducting media- penetration or skin depth.

List of Experiments: **30 Hours**

1. Verification of Ohms' law.
2. Test the Faraday's hypothesis of magnetic field induction.
3. Determination of specific resistance of the given material using Carey foster's bridge.
4. Determination of Dielectric constant of a given material.
5. Determination of inductance using Maxwell's bridge.
6. Determination of wavelength of the given light source using spectrometer.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the laws and concepts of static electric field	Understand
CO2: Explain the laws and concepts of static magnetic field	Understand
CO3: Explain the behavior of materials in electric and magnetic fields	Understand
CO4: Explain time varying electric and magnetic fields using Maxwell's equation	Understand
CO5: Explain the phenomenon of Electromagnetic wave propagation in different media	Understand

Text Book(s):

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T1. R.K.Gaur and S.L.Gupta, "Engineering Physics", DhanpatRai publications, New Delhi, 8th Edition, 2011.

T2. M.N.Avadhanulu and P.G.Kshirsagar, "Text Book of Engineering Physics", S. Chand & Company Ltd., New Delhi, 2014.

T3. W. H. Hayt and John A. Buck, "Engineering Electromagnetics", Tata McGraw Hill, New Delhi. 6th Edition, 2014.

Reference Book(s):

R1. David Griffiths, "Introduction to Electrodynamics", 4th Edition, Pearson Education, 2013

R2. D. Halliday., R. Resnick and J. Walker, "Fundamentals of Physics", Wiley Publications, 2008.

R3. K. A. Gangadhar and P. M. Ramanathan, " Electromagnetic Field Theory", Khanna Publishers, New Delhi, 5th Edition, 2013.

R4. Mathew. N. O. Sadiku, " Elements of Electromagnetics", 4th Edition, Oxford University Press, 2009

R5. John D. Kraus and Daniel A. Fleisch, " Electromagnetic with Applications", Tata McGraw Hill, New Delhi. 5th Edition, 2010.

Web References:

1. http://openems.de/start/index.php
2. http://nptel.iitm.ac.in

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO2	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO3	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO4	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO5	1	-	-	-	-	-	-	1	2	3	-	-	-	-

High-3; Medium-2; Low-1

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Assessment Pattern:

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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BOS Chairman

HOD-Electrical and Electronics En
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Course Code:19MESC2001		Course Title: Introduction to Engineering (Common to AU,EC,EE,EI,ME and MC)	
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain the career opportunities in engineering
2. Explain how to acquire engineering competencies
3. Explain how to remain, relevant and versatile as an engineer
4. Observe engineering products and processes
5. Take ownership for learning and development
6. Identify and rectify unsafe conditions and acts

Unit I Career Opportunities in Engineering **5 Hours**

Technicians, engineers and scientists, history of engineering. 17 sustainable development goals set by UNO, concept of small e to big E. career choices for an engineer, types of industries, academia and research as career choices, entrepreneurship as a career choice, various departments in engineering industries, roles available in engineering industries. innate skills, learnt skills (competencies), graduate attributes, roles of engineers and the corresponding competencies, career opportunities in engineering in terms of roles & competencies

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Unit II **Developing Specific Skills and Competencies** **5 Hours**

OBE Model, PEOs and POs, technical POs, professional POs, mapping with Graduate attributes, Classification of courses, resources available in the campus and e-resources, resources and facilities available to acquire specific competencies, on-campus and off-campus activities, the methods by which students can systematically involve in activities, significance of professional skill courses, plan for utilizing the resources and facilities to develop specific competencies.

Unit III **Staying Relevant through Continuous Improvement / Environmental Versatility** **7 Hours**

Rate of change, technology life cycle (TLC), features of a dynamic and complex environment in which students operate or will operate, impact of globalization & technical advancements, importance of remaining, relevant and versatile in a dynamic and complex environment with the help of technology life cycle, activities/process to remain relevant and versatile, environmental scanning, Life- long learning.

Unit IV **Observe every Product And Processes with an Engineering Perspective and Inquisitiveness** **4 Hours**

Product -Need, purpose - primary and secondary function, various stages of manufacturing and its processes. Product - assembly of several simple engineering devices/systems. Product-Parts, principles and laws (mechanical, electrical and electronics), functional relationship between the parts, role of programming in engineering products. Significance of materials and their advancements in improvements in product.

Unit V **Learning and Development Leveraging the Resources and Infrastructure** **6 Hours**

Process Of Learning, Situated Learning with Examples, Own Learning (Not Copying), Differences between Real Life and Simulated Environment, the Sprit Of Experimentation, Various Learning Enablers, Measure the performance against the plan.

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Unit VI Unsafe Conditions and Acts and following Environment Friendly Practices **3 Hours**

Safety-definition, importance of personal safety. Statistics of road accidents. Unsafe condition and unsafe act- definition, cause and effects, identification of the unsafe conditions and acts in home/hostel, labs, class rooms, public places. Importance of environment friendly practices.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the career opportunities in engineering in terms of roles & competencies	Understand
CO2: Explain how a student can acquire the competencies	Understand
CO3: Explain how to remain, relevant and versatile in a dynamic and complex environment	Understand
CO4: Observe every product and processes with an engineering perspective and inquisitiveness	Apply
CO5: Choose to take ownership for his/her learning and development leveraging the resources and infrastructure	Understand
CO6: Identify and rectify unsafe conditions and acts and follow environment friendly practices	Understand

Text Book(s):

T1. Worksheets and Handouts prepared by MCET team.

Reference Book(s):

R1. L. A Bloomfield, "How things work: The physics of everyday life", Wiley, 5th Edition, 2013.

R2. C. Mason, "How things work," Usborne Publishing Ltd 2009.

R3. D.K. Publishing, "How things work encyclopedia", 2010.

R4. J. E. Gordon, "The New Science of Strong Materials or Why You Don't Fall through the Floor" Princeton University Press; With a New introduction by Philip Ball,2018.

R5. R.P. Feynman," Six Easy Pieces: Essentials of Physics Explained by Its Most Brilliant Teacher", Basic Books; 4th Edition 2011.

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Web References:

1. https://en.wikibooks.org/General_Engineering_Introduction/Engineering_Science
2. https://science.howstuffworks.com/engineering-channel.html

Laboratory Component **30 Hours**

List of RiaLab Exercises

1. Career opportunities with roles and responsibilities
2. Observe every product and processes with an engineering perspective and inquisitiveness

a) Primary and Secondary functions of products and their equivalents

b) Primary and Secondary functions of parts of the products, their manufacturing processes and materials

c) Structural and functional relations of the product

3. Safe and unsafe acts and conditions in day-to-day life and professional practices.
4. Skills for Hobby project (At least TWO)

a) Soldering and de-soldering practices

b) Circuit and component testing using multi-meter & CRO

c) Battery operated circuit connections and testing

d) Simple switching circuits using relays and transistors

e) Adhesives used in part assembly

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	1	1	2	-	2	-	-
CO2	2	-	-	-	-	-	-	1	-	1	-	1	-	-
CO3	2	-	-	-	-	-	-	1	-	1	-	1	-	-
CO4	3	-	-	-	-	-	-	3	3	3	2	3	-	-
CO5	2	-	-	-	-	-	-	1	-	1	-	1	-	-
CO6	2	-	-	-	-	-	-	1	1	2	-	2	-	-

High-3; Medium-2; Low-1

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Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,4	50	20
	CCET II	2,3	50	
	CCET III	5,6	50	
	Continuous Assessment – Practical	1,2,3,4,5,6	75	10
	Final Assessment – Practical	2,4	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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Course Code:19MESN4101	Course Title: Engineering Graphics		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 1: 0: 3	Credits:2.5	Total Contact Hours:60	Max Marks:100
Pre-requisites			

- NIL

Course Objective

The course is intended to:

1. Communicate combination of basic shapes using engineering drawing

Unit I **Introduction to Engineering Drawing** **10 Hours**

Importance of engineering drawing – Types of pencils – Drawing sheets – Freehand sketching –Dimensions to construct – 2D geometries – 3D solids – Types of geometries and solids – Transformation of 2D geometries into 3D solids

Unit II **Freehand Sketching** **10 Hours**

Pictorial view – Multiple views – Basic solids – Combination of basic solids

Unit III **AutoCAD** **15 Hours**

Getting started – Graphical User Interface – Work space settings – Drawing commands – Modifying commands – Annotations - Plot.

Unit IV **Orthographic Projection** **15 Hours**

Principles of projection – First angle projection – Third angle projection – Combination of basic solids – Sectional views – Auxiliary views

Unit V **Development of Surfaces** **10 Hours**

Development of lateral surfaces of simple solids – Prisms, pyramids, cylinders and cones.

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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1. Communicate combination of basic shapes using engineering drawing in AutoCAD meeting all the required standards	Apply

Text Book(s):

T1. Cencil Jensen, Jay D.Helsel and Dennis R. Short, " Engineering Drawing and Design", Tata McGraw Hill India, New Delhi, 7th Edition (2017).

T2. Bhatt N.D. and Panchal V.M., "Engineering Drawing",Charotar Publishing House, Gujarat, 53rdEdition (2015).

T3. K. V. Natrajan, "A Text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 48thEdition (2018).

Reference Book(s):

R1. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

R2. Cencil Jensen, Jay D. Helsel and Dennis R. "Short Engineering Drawing and Design". Tata McGraw Hill Publishing Company Limited (2012).

Publications Of Bureau Of Indian Standards

1. IS 10711 – 2001: Technical products Documentation – Size and lay out ofdrawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawihgs.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods. The mode of delivery is like practical

Web References:

1. http://nptel.ac.in/courses/112103019/
2. https://en.wikipedia.org/wiki/Engineering_drawing

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Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	0	2	2	-	-	-	2	2	-	-	-	-

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1	75	75
	Cycle Test 1	1	50	25
	Cycle Test 2	1	50	
			Total	100

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HOD-Electrical and Electronics Engg
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code:19PSHG3001		Course Title:Wellness for Students (Common to all B.E/B.TechProgrammes) (2019 Batch only)	
Course Category: Humanities		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0 :2	Credits:1	Total Contact Hours:30	Max Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Articulate the importance of wellness for success in life
2. Understand the dimensions of wellbeing and relevant practices
3. Guide in adopting such practices to improve wellness
4. Reflect the impact of changes sensed on personal and social effectiveness

Unit I Wellness - Importance and Dimensions

Values and aspirations – goals – SMART Goals – means for achieving goals – job Vs career – success in life – attributes of successful persons. Maslow's Hierarchy of needs motivation - Concept of wellness – impact of absence of wellness - Wellness as important component to achieve success.

Wellbeing as per WHO - Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods – Guna – causes and impact - multiple dimensions of human structure (physical, astral, causal bodies) – human-panchabootha relationship.

Unit II Practices for Physical Wellness through Yoga

Simplified Physical Exercises: Hand, Leg, Neuromuscular breathing, eye exercises, kapalabathy, makarasanam 1 & 2, body massage, 14-points acupressure – Suryanamaskar - relaxation. Simple asanas.

Unit III Practices for Physical Wellness through Exercises

Fitness as a subset of Wellness – health related physical fitness - skill related physical fitness. Exercises related ailment and injuries - safety and precautions - first aid.

Fitness development: Muscular strength – exercises (calisthenics): pull-up, sit-up, push-up and weight training; Explosive power – exercises: vertical jump, long jump; Cardio respiratory endurance– exercises: walking, jogging, treadmill, stair climbing, bicycling, skipping; Flexibility – exercises: stretching.

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Speed, agility, balance and coordination – exercises: sprint, cone drill, ladder drill, hurdle drill, ball throw - mental agility exercises.

Unit IV Practices For Mental Wellness

Meditation: Mind and its functions - mind wave frequency - Agna, Thuriyam and Shanthi meditation – introspection: analysis of thoughts, moralization of desire, neutralization of anger and eradication of worries - simple mindfulness exercises.

Unit V Practices for Social and Spiritual Wellness

Kayakalpa yoga - youthfulness and life force - cultural education – greatness of guru – universal compassion – fivefold culture.Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.

Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas.

Course Outcomes	**Cognitive/ Affective**
At the end of this course, students will be able to:	
CO1: Explain the concept of wellness and its importance to be successful in career and Life	Understand
CO2: Explain the dimensions of wellness and practices that can promote wellness	Understand
CO3: Demonstrate the practices that can promote wellness	Respond
CO4: Sense and improve the wellness periodically and its impact on personal Effectiveness	Value
CO5: Maintain harmony with self, family, peers, society and nature	Internalize

Text Book(s):

T1. Reading material and workbook prepared by PS team of the college.

Reference Book(s):

R1.Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar ,"Value education for harmonious life (Manavalakalai Yoga)", Vethathiri Publications, Erode, Edition. (2010).

R2.Dr.R.Nagarathna, Dr.H.R.Nagendra, "Integrated approach of yoga therapy for positive health", Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Edition.

R3.Tony Buzan, Harper Collins, The Power of Physical Intelligence (English).

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Course offering:

Orientation programme (3 days)	CO1 and CO2
Student practice (weekly review classes)	CO3
Student journal writing (interim reviews)	CO4 and CO5

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	1	-	-	-	-	-
CO2	-	-	-	-	-	-	1	1	1	-	-	-	-	-
CO3	-	-	-	-	-	1	1	1	1	-	-	1	-	-
CO4	-	-	-	-	-	1	1	-	1	-	-	-	-	-
CO5	-	-	-	-	-	1	1	-	1	-	-	1	-	-

High-3; Medium-2;Low-1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	**Yoga:**	1,2,3,4,5		75
	Physical Exercises, KayaKalpa		15	
	Meditation		15	
	Assessment of student's workbook		10	
	Sports:			
	Physical Exercises, KayaKalpa		20	
	Assessment of student's workbook		15	
End Semester Examination (combined for yoga and sports)	Written test (MCQ and short answers)	1,2,3,4,5	30	Marks out of 100 is reduced to 25
	Physical exercises		50	
	Viva-voce		20	
			Total	100

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Semester II

Course Code:19ENHG2201		Course Title:Communication Skills - II	
CourseCategory: Humanities		CourseLevel: Introductory	
L:T:P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max Marks:100

Pre-requisites

- Communication Skills I

Course Objectives

The course is intended to:

1. Listen and understand monologues and dialogues of a native speaker on par with B2 of CEFR level
2. Speak in simple sentences to convey their opinion and ideas on par with B2 of CEFR level
3. Read and infer a given text on par with B2 of CEFR level
4. Draft basic formal written communication on par with B2 of CEFR level

Unit I Listening **15 Hours**

Importance and purpose of extensive listening and intensive listening -Body Language – Listening tasks on complex and abstract themes- Correlating Ideas related to listening input – importance of empathetic- listening for main ideas – Paraphrasing- Listening to native speakers English –Compound and Complex sentences - Developing ideas – Listening to compose paragraphs.

15 Hours

Unit II Speaking

Jotting down ideas collected from listening to speak – organising the ideas – Expressing one's view coherently – Understanding grammatical elements (Noun – Pronoun Antecedent) – Expressing ideas assertively – Answering questions during presentations – Understanding the use of discourse markers – word stress and sentence stress – voice modulation and pauses – Highlighting significant points – interpretation of visual data – Using verbal cues - Preparing simple hand - outs.

15 Hours

Unit III Reading

Reading strategies – Skimming &Scanning – Inferring meaning- Barriers to reading – sub vocalisation, Eye fixation, Regression – Speed Reading Techniques - Reading different types

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of texts and their contexts with speed – Note making – Reading a review – Paraphrasing – Reading to comprehend

15 Hours

Unit IV Writing

Reported speech& Concord (Subject - verb Agreement) - Report writing - Different kinds of Report - Structure of the report - Writing Proposal - Plagiarism – References – Appendices – Techniques for Report writing – Registers.

List of Tasks

1. BEC Vantage Listening Test – I &Speaking Test–1
2. BEC Vantage Listening Test – 2 & Speaking Test – 2
3. BEC Vantage Listening Test – 3 & Speaking Test – 3
4. BEC Vantage Listening Test – 4 & Speaking Test – 4
5. BEC Vantage Listening Test – 5 & Speaking Test – 5
6. BEC Vantage Listening Test – 6 & Speaking Test – 6

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Listen actively and empathetically, and paraphrase discussions and presentations on complex and abstract themes and topics	Apply
CO2: Express one's views coherently, fluently and confidently highlighting the significant points with supporting details	Apply
CO3: Read and comprehend different types of texts and their contexts reasonably at moderate speed	Understand
CO4:Write detailed reports on variety of subjects synthesizing information gathered during listening & reading citing appropriate references	Apply

Text Book(s):

T1. Whitby Norman, Business Benchmark Upper Intermediate Students' Book CUP Publications, 2nd Edition, 2014

T2. Learners Book prepared by the Faculty members of Department of English

Reference Book(s):

R1. Cambridge BEC Vantage - Practice Tests, Self-study Edition, Cambridge University Press, 2002

R2. Hewings Martin - Advanced Grammar in use - Upper-intermediate Proficiency, CUP, 3rdEdition, 2013.

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Web References:

1. http://www.grammarinenglish.com -Jan 23, 2018
2. https://www.northshore.edu/support_centre /pdf/listen-notes.pdf
3. http://www.examenglish.com/BEC/BEC_Vantage.html- Jan 23, 2018

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	2	3	-	-	-	-
CO2	2	-	-	-	-	-	-	1	2	3	-	-	-	-
CO3	1	-	-	-	-	-	-	1	-	3	-	-	-	-
CO4	2	-	-	-	-	-	-	1	-	3	-	-	-	-

High-3; Medium-2;Low-1

Assessmentpattern:

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	2,3,4	50	20
	CCET II	2,3,4	50	
	CCET III	2,3,4	50	
	Continuous Assessment – Practical	1,2	75	10
	Final Assessment – Practical	1,2	50	10
End Semester Examination	ESE	2,3,4	100	60
			Total	100

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Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code:19MABC1201		Course Title:Ordinary Differential Equations and Complex Variables (Common to AU,CE,EC,EE,EI,ME and MC)	
Course Category: Basic Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

- Matrices and Calculus

Course Objectives

The course is intended to:

1. Explain the concepts of vector differentiation and integration
2. Determine the solution of second and higher order ordinary differential equations
3. Construct analytic functions
4. Use the concept of complex integration to evaluate definite integrals
5. Apply Laplace transform techniques to solve ordinary differential equations

Unit I Vector Calculus **9+3 Hours**

Gradient – Divergence – Curl – Line integrals – Surface integrals – Volume integrals – Theorems of Green,Gaussand Stokes (without proof)and their applications.

Unit II Complex Variables (Differentiation) **9+3Hours**

Cauchy-Riemann equations – Analytic functions – Properties – Harmonic functions – Finding harmonic conjugate – Conformal mapping (w=z+a, w= az, w=1/z) – Mobius transformation and their properties.

Unit III Complex Variables (Integration) **9+3 Hours**

Contour integrals – Cauchy Integral formula (without proof) – Cauchy Integral theorem – Taylor's series – Singularities of analytic functions – Laurent's series–Residues – Cauchy Residue theorem (without proof) – Evaluation of real definite integrals around unit circle and semi-circle (Excluding poles on the real axis).

Unit IV Ordinary Differential Equations of Higher Orders **9+3 Hours**

Second and higher order linear differential equations with constant coefficients – Second order linear differential equations with variable coefficients (Cauchy - Euler equation–Legendre's

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equation) – Method of variation of parameters – Solution of first order simultaneous linear ordinary differential equations

Unit V -Laplace Transform **12 Hours**

Laplace Transform – Properties of Laplace Transform – Laplace transform of integrals – Laplace transform of periodic functions -Inverse Laplace transforms - Convolution theorem – Solution of ordinary differential equations by Laplace Transform method– Applications on engineering problems.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1:Explain the concepts of vector differentiation and integration.	Apply
CO2: Use the concept of complex variables to construct analytic functions	Apply
CO3: Use the concept of complex integration to evaluate definite integrals	Apply
CO4:Determine the solution of second and higher order ordinary differential equations	Apply
CO5: Apply Laplace transform techniques to solve ordinary differential equations	Apply

Text Book(s):

T1. Erwinkreyzig, Advanced Engineering Mathematics, 9th Edition,, John Wiley& Sons, 2006.

T2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi, 2008.

T3. Ramana B.V., higher Engineering Mathematics, Tata McGraw-Hill, New Delhi, 11th Reprint, 2010.

Reference Book(s):

R1. G.B.Thomas and R.L Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2002.

R2. N.P.Bali and Manish Goyel, A text book of Engineering Mathematics, Laxmi Publication, Reprint, 2008.

R3. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Web References:

1.https://onlinecourses.nptel.ac.in/noc16_ma05

2. https://nptel.ac.in/courses/122101003/2

3. https://nptel.ac.in/courses/111105035/22

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Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	2	2	3	-	2	-	-
CO2	3	-	-	-	-	-	-	2	2	3	-	2	-	-
CO3	3	-	-	-	-	-	-	2	2	3	-	2	-	-
CO4	3	-	-	-	-	-	-	2	2	3	-	2	-	-
CO5	3	-	-	-	-	-	-	2	2	3	-	2	-	-

High-3; Medium-2;Low-1

Assessmentpattern:

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	Tutorial/ Quiz/ Assignment	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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Dr. Mahalingam College of Engineering and Technology
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Course Code:19PHBC2001		Course Title:Physics for Electrical Sciences (Common to EC,EE,EI) (2020 Batch onwards)	
Course Category: Basic Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain the concepts of static electric field
2. Explain the concepts of static magnetic field
3. Explain the behavior of materials in electric and magnetic fields
4. Explain electric and magnetic fields using Maxwell's equation
5. Explain the phenomenon of Electromagnetic wave propagation

Unit I Electrostatics **9 Hours**

Definition of electric charge-Coulomb's Law – Electric field intensity – Field intensity due to point and line charges – Electric flux density -Gauss's law- Application of Gauss's law: Due to a line charge and a plane sheet of charge – Electric potential-Equipotential surfaces-Potential gradient.

Unit II Magnetostatics **9 Hours**

Definition of magnetic flux- magnetic field intensity-Lorentz Law of force- Biot –savart Law, Ampere's Law- Application of Ampere's Law: Magnetic induction due to a long linear conductor and solenoid - Magnetic field due to straight conductors- circular loop – Magnetic flux density (B) - Magnetic potential.

Unit III Electric and Magnetic Fields in materials **9 Hours**

Dielectrics: An atomic view - Dielectric Polarization- Dielectrics and Gauss's law- Dielectric Strength- Energy stored in a dielectric medium - Capacity of a condenser - Capacitance - coaxial, Spherical capacitor- Poisson and Laplace Equation.

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Magnetic susceptibility and permeability- properties of dia, para and ferro magnetic materials- hysteresis loop.

Unit IV Electromagnetic Induction **9 Hours**

Faraday's law – Lenz's law – Time varying magnetic field - self Inductance - self Inductance of a solenoid- Mutual inductance- Mutual inductance of two solenoids. Charge conservation law - continuity equation- displacement current- Maxwell's equations.

Unit V Electromagnetic Waves **9 Hours**

Electromagnetic waves in free space - Poynting vector - Propagation of electromagnetic waves in dielectrics – Phase velocity- Propagation of electromagnetic waves through conducting media- penetration or skin depth.

List of Experiments: **30 Hours**

1. Verification of Ohms' law.
2. Test the Faraday's hypothesis of magnetic field induction.
3. Determination of specific resistance of the given material using Carey foster's bridge.
4. Determination of Dielectric constant of a given material.
5. Determination of inductance using Maxwell's bridge.
6. Determination of wavelength of the given light source using spectrometer.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the laws and concepts of static electric field	Understand
CO2: Explain the laws and concepts of static magnetic field	Understand
CO3: Explain the behavior of materials in electric and magnetic fields	Understand
CO4: Explain time varying electric and magnetic fields using Maxwell's equation	Understand
CO5: Explain the phenomenon of Electromagnetic wave propagation in different media	Understand

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Text Book(s):

T1. R.K.Gaur and S.L.Gupta, "Engineering Physics", DhanpatRai publications, New Delhi, 8th Edition, 2011.

T2. M.N.Avadhanulu and P.G.Kshirsagar, "Text Book of Engineering Physics", S. Chand & Company Ltd., New Delhi, 2014.

T3. W. H. Hayt and John A. Buck, "Engineering Electromagnetics", Tata McGraw Hill, New Delhi. 6th Edition, 2014.

Reference Book(s):

R1. David Griffiths, "Introduction to Electrodynamics", 4th Edition, Pearson Education, 2013

R2. D. Halliday., R. Resnick and J. Walker, "Fundamentals of Physics", Wiley Publications, 2008.

R3. K. A. Gangadhar and P. M. Ramanathan, " Electromagnetic Field Theory", Khanna Publishers, New Delhi, 5th Edition, 2013.

R4. Mathew. N. O. Sadiku, " Elements of Electromagnetics", 4th Edition, Oxford University Press, 2009

R5. John D. Kraus and Daniel A. Fleisch, " Electromagnetic with Applications", Tata McGraw Hill, New Delhi. 5th Edition, 2010.

Web References:

1. http://openems.de/start/index.php
2. http://nptel.iitm.ac.in

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO2	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO3	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO4	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO5	1	-	-	-	-	-	-	1	2	3	-	-	-	-

High-3; Medium-2; Low-1

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Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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Dr. Mahalingam College of Engineering and Technology
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Course Code:19CHBC2001		Course Title:Chemistry for Electrical Sciences (Common to EC,EE and EI) (2019 Batch only)	
CourseCategory: Basic Science		CourseLevel: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Pre-requisites

- Higher Secondary Chemistry I and II

Course Objectives

The course is intended to:

1. Explain the principles of electrochemistry and batteries
2. Explain the mechanism of corrosion and corrosion control
3. Explainthe concepts of spectroscopic techniques
4. Describe the basics of biofuels and fuel cells
5. Describe synthesis, properties and applications of nano-materials

Unit I Electrochemistry and Batteries **9Hours**

Cells – Types of cells– galvanic and electrolytic cells – emf and its measurement – Nernst equation –Batteries – types and Characteristics, Construction, working and applications - Alkaline battery, Lead –Acid battery, Nickel-Cadmium battery, Lithium ion battery

Unit II Corrosion and its Control **9 Hours**

Corrosion – dry and wet corrosion – mechanism of electrochemical corrosion – galvanic corrosion and concentration cell corrosion, Factors influencing corrosion. Corrosion Control methods – Cathodic protection methods, Metallic coating – Galvanizing, Tinning – Chrome plating and Electroless plating of Nickel

Unit III Spectroscopic Techniques **9 Hours**

Spectroscopy- Electromagnetic spectrum, Absorption and Emission spectroscopy – Relationship between absorbance and concentration – Derivation of Beer-Lambert's law (problems). UV – Visible Spectroscopy, Atomic Absorption Spectroscopy, Flame photometry – Principle, Instrumentation and applications.

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Unit IV Biofuels and Fuel Cells **9 Hours**

Biomass – Biogas – Constituents, manufacture and uses. General outline of fermentation process – manufacture of ethyl alcohol by fermentation process. Combustion – Calorific values – Gross and bet calorific value – problems based on calorific value. Fuel cells – Construction working and applications of Hydrogen Oxygen fuel cells, methanol oxygen fuel cells, solid oxide fuel cells

Unit V Synthesis and Applications of Nano Materials **9 Hours**

Introduction – Difference between bulk and Nano materials – size dependent properties. Nano scale materials –particles, clusters, rods and tubes. Synthesis of Nanomaterials: Sol-gel process, Electro deposition, Hydrothermal methods. Applications of Nano materials in Electronics, Energy science and medicines. Risk and future perspectives of nano materials.

List of Experiments **30 Hours**

1. Estimation of iron in water by spectrophotometry
2. Estimation of Fe^{2+} by potentiometric titration
3. Determination of corrosion rate by weight loss method
4. Measurement of emf of electrochemical cell – Poggendorff's method
5. Determination strength of acid by pHmetry
6. Conductometric titration of strong acid against strong base

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explainbatteries based on their characteristics, construction, working principle and applications	Understand
CO2: Explain the mechanism of corrosion and its control techniques	Understand
CO3: Use Beer- Lambert's law and other spectroscopic methods for chemical analysis	Apply
CO4: Calculate energy potential of fuel cells and calorific value of biofuels	Apply
CO5: Describe synthesis, properties and applications of nano-materials	Understand

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Dr. Mahalingam College of Engineering and Technology
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Text Book(s):

T1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Ed., DhanpatRai Pub, Co., New Delhi (2018).

T2. Wiley Engineering Chemistry, 2nd Edition, Wiley India Pvt. Ltd. New Delhi (2011).

Reference Book(s):

R1. S. S. Dara, S. S. Umare "A text book of Engineering Chemistry" 12th edition S. Chand & Co. Ltd., New Delhi (2014).

R2. Charles P. Poole, Jr., Frank J. Owens "Introduction to Nanotechnology" Wiley India Pvt. Ltd. New Delhi (2003)

Web References:

1. http://nptel.ac.in/courses/122101001/downloads/lec.23.pdf
2. https://nptel.ac.in/courses/104106075/Week1/MODULE%201.pdf
3. https://nptel.ac.in/courses/103102015/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO2	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO3	2	-	-	-	-	-	-	1	2	3	-	-	-	-
CO4	2	-	-	-	-	-	-	1	-	1	-	-	-	-
CO5	1	-	-	-	-	-	-	1	-	1	-	-	-	-

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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Dr. Mahalingam College of Engineering and Technology
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Course Code:19EESN2201	Course Title: Electron Devices		
CourseCategory:Engineering Science		CourseLevel: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Pre-requisites

- Physics for Electrical Sciences

Course Objectives

The course is intended to:

1. Explain the various terminologies of electrical quantities in AC and DC Circuits
2. Differentiate special diodes from PN junction diodes
3. Explain the construction and characteristics of Bipolar Junction Transistors
4. Explain the construction and operation of Junction Field Effect Transistors
5. Describe the operation of MOSFETs and basic power devices

Unit I Electrical Quantities 9Hours

Need of S.I.Units, Definitions of electrical quantities: Charge, Resistivity, Conductivity, Voltage, Current, Power, Energy. **DC Circuits:** Ohms Law, Kirchhoff's Current Law and Voltage Law. Behavior of R, L, C in DC circuits, Series resistive circuit-Voltage division rule, Parallel resistive circuit-Current division rule and series-parallel resistive circuit.**AC Circuits:** Faradays laws of electromagnetic induction. Alternating Quantities: Time period, Cycle, frequency, Angular frequency, Expression of average value, RMS value, Form factor, peak factor of sinusoidal waveform. Behavior of R, L, C circuit. Power factor concepts in series RL, RC and RLC circuit. Power triangle – Active power, Reactive power and Apparent power.

Unit II Diodes 9 Hours

Semiconductor Diode: PN junction - forward and reverse bias conditions. Ideal diode - Practical diode - V-I Characteristics of a diode – Temperature dependence of the V-I Characteristics – Diode specifications – Diode Resistance – Static and dynamic – Diode

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junction Capacitance – Transition and Diffusion capacitances - Diode Equivalent circuits.

Special Diodes:Zener diode - Schottky Diode, Light emitting diodes – Photo diodes – Diode numbers and lead identification – Diode testing.

Unit III Bipolar Junction Transistors **9 Hours**

Bipolar Junction Transistor and its types – NPN and PNP Transistor – Transistor operation - Configurations of BJT – Input and output characteristics of CE, CB and CC configurations. Eber -Moll Model of transistors – Transistor as a switch – Transistor specifications – lead identification –Package types –Transistor testing.

Unit IV Field Effect Transistors **9 Hours**

BJT versus FET - JFET and its types, construction and operation of n- channel and p-channel JFETs – characteristics curves – Effect of temperature on JFET parameters – FET characteristic parameters and specifications – FET data sheet specifications. FET applications – Testing FETs.

Unit V MOSFETS and Power Devices **9 Hours**

MOSFETs: Depletion MOSFETs and Enhancement MOSFETs – Differences between JFETs and MOSFETs –Precaution in handling MOSFETs, MOSFET as a switch.Construction and operation of Power transistor, UJT, SCR, Diac,Triac and IGBT.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the various terminologies of electrical quantities in AC and DC Circuits	Understand
CO2: Differentiate special diodes from PN junction diodes	Understand
CO3: Explain the construction and characteristics of Bipolar Junction Transistors	Understand
CO4: Explain the construction and operation of Junction Field Effect Transistors	Understand
CO5: Describe the operation of MOSFETs and basic power devices	Understand

Text Book(s):

T1.V.Jegatheesan, K.Vinoth Kumar & R.Saravanakumar, Basic Electrical and Electronics Engineering, Wiley India, 1st Edition,2011.

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T2. Millman.J, Halkias.C and SatyebrantaJit, "Electronic Devices & Circuits", TMH, New Delhi, 2nd Edition,2008.

Reference Book(s):

R1. Anil K.Maini, VarshaAgarwal, "Electronic Devices and Circuits", Wiley India Private Ltd, New Delhi, 1st Edition, 2015.

R2. Salivahanan.S, Suresh Kumar.N and Vallavaraj.A, "Electronic Devices and Circuits", TMH, New Delhi, 2nd Edition,2008.

R3. Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory" Pearson Prentice Hall, 10th Edition, July 2008.

R4. Streetman Ben G. and Banerjee Sanjay, "Solid State Electronic devices", PHI, 6th Edition, 2006.

R5. David A. Bell, "Electronic Devices and Circuits", Oxford, 5th Edition, April 2008.

Web References:

1. http://nptel.ac.in/video.php?subjectId=117103063
2. http://nptel.ac.in/video.php?subjectId=117106091
3. www.youtube.com/watch?v=Wf19II0ts84

Laboratory Component **30 Hours**

List of Experiments:

1. Verification of Kirchhoff's Current and Voltage Law.
2. a)Verification of Voltage division rule
   b) Verification of Current division rule
3. Measurement of peak value, average value, RMS value of sinusoidal waveform using CRO
4. Testing of Diodes
5. V-I Characteristics of Diode
6. Testing of Transistors and FETs

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	1	1	-	-	1	2	3	-	2	-	-
CO2	1	1	-	1	1	-	-	1	2	3	-	1	-	-
CO3	1	1	-	1	1	-	-	1	1	2	-	1	-	-
CO4	1	1	-	1	1	-	-	1	1	2	-	1	-	-
CO5	1	1	-	1	1	-	-	2	1	2	-	1	-	-

High-3; Medium-2;Low-1

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Assessment pattern:

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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Course Code:19CSSC2001	Course Title: C Programming (Common to AU,CE,EC,EE,EI,ME and MC)		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain about computer organization and problem solving techniques
2. Write programs using appropriate programming constructs
3. Develop programs using arrays, functions & strings
4. Implement programs using pointers, structures& unions
5. Write programs using files & preprocessor directives

Unit I **Introduction** **7 Hours**

Generation and Classification of Computers –Basic Organization of a Computer – Software development life cycle – Problem Solving Techniques :Algorithm,Pseudocode andFlow Chart.

Unit II **C Programming Basics** **10 Hours**

Introduction to C programming – Structure of a C program – Keywords – Identifiers-Constants– Variables –Data Types– Operators and Expressions –Formatted & Unformatted I/O functions– Decision statements –Loop control statements.

Unit III **Arrays,Functionsand Strings** **10 Hours**

Arrays: Characteristics –One-dimensional and Two-dimensional arrays – Functions: Declaration & Definition of function –Built in function – User defined function –Types of functions –Call by value &reference– Strings: Formatting strings–String handling functions.

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Unit IV **Pointers, Structures and Union** **9Hours**

Pointers: Features and Types of pointers – Arithmetic operations with pointers–Pointers and Arrays –Structures: Features– Operations on Structures–Array of structures – Unions.

Unit V **Files and Pre-Processor Directives** **9 Hours**

Introduction to Files –Stream and File Types–File operations (Open, close, read, write) – Command line arguments–Pre-processor Directives: Macro Expansion, File Inclusion, Conditional Compilation.

Laboratory Component **30 Hours**

List of Experiments:

1. Programs to process data types, operators and expression evaluation(any 1)
    a. To find area of rectangle/circle/square
    b. To find the simple interest and compound interest
2. Programs using decision and looping statements(any 2)
    a. To find the maximum number among 3 given numbers
    b. To check whether given year is leap year or not
    c. To display the Fibonacci series
    d. To find the factorial of a number
3. Programs using Arrays
    a. To search for particular number among N numbers(1D array)
    b. To compute matrix addition (2 D array)
4. Programs using Functions and Strings(any 2)
    a. To swap two numbers using call by reference
    b. To find the cube of a number
    c. To manipulate strings using string functions
    d. To check whether the string is palindrome or not
5. Programs using Pointer, Structure & Union
    a. To perform arithmetic operations using pointers
    b. To display the information of N students using Structure
    c. To display the employee details using Union
6. Programs using Files (any 1)
    a. To read the contents of a text file
    b. To copy the contents from one file into another

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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain about computer organization and problem solving techniques	Understand
CO2: Write programs for the given scenario using appropriate programming constructs	Apply
CO3: Develop programs using arrays, functions & strings for the given scenario	Apply
CO4: Implement programs for given application using pointers, structures& unions	Apply
CO5: Write programs using files & preprocessor directives for simple problems	Apply

Text Book(s):

T1. Ashok N.Kamthane, Amit.N.Kamthane, "Programming in C", 3rdEdition, Pearson Education, 2015.

Reference Book(s):

R1. Ajay Mittal, "Programming in C-A Practical Approach ",3rdEdition, Pearson Education, 2010.

R2. YashavantP.Kanetkar, "Let Us C", 16thEdition, BPB Publications,2018

R3. PradipDey, ManasGhosh, "Computer Fundamentals and Programming in C", 2ndEdition, Oxford University Press,2013

Web References:

1. http://www.cprogramming.com/
2. http://www.c4learn.com/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	1	1	2	-	-	-	-
CO2	2	-	-	-	-	-	-	1	1	2	-	-	-	-
CO3	2	-	-	-	-	-	-	1	1	2	-	-	-	-
CO4	2	-	-	-	-	-	-	1	1	2	-	-	-	-
CO5	2	-	-	-	-	-	-	1	1	2	-	-	-	-

High-3; Medium-2;Low-1

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Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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Course Code:19EECN4201		Course Title:Electrical CAD	
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 1: 0: 3	Credits:2.5	Total Contact Hours:60	Max Marks:100

Prerequisites:

- Nil

Course Objectives

The course is intended to:

1. Draw electrical and electronics engineering drawings as per standards
2. Prepare PCB engineering documents for electronic circuits
3. Prepare electrical wiring and wiring harness documents for electronic circuits

List of experiments:

Unit I Introduction to ECAD 9+6 Hours

Drawings – documents – symbols – terminologies – structure - drawing tools –Standards: need, list - IPC, ISO.

Experiment-1. Identification of electrical and electronics components based on their symbols

Unit II – PCB Design **3+24Hours**

PCB design flow - capture project setup: design inputs, schematic, net list
PCB engineering: board, part, noise, trace width, space, signal layer and power/ground layers
Setup PCB: physical requirements, footprint, DRC, route, silk screen and annotation

Experiment-2.PCB design for LED circuit

Experiment- 3.PCB design for diode bridge rectifier

Experiment - 4.PCB design for voltage regulator

Experiment - 5.PCB design for a power supply circuit

Experiment - 6.PCB design to interface a switch

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Experiment - 7.PCB design for multivibrator circuit

Experiment - 8.PCB design for water level controller **(Product - PBL 1)**

Unit III Wiring and Harness Diagram **3+15Hours**

Wiring and harness diagram – necessity - Schematic: connectors, wires & cables, size, length - Wiring Harness: cable markers, part no, labels and publish project

Experiment - 9. Wiring schematic diagram of fog lamp for a car

Experiment - 10. Wiring harness diagram of fog lamp for a car

Course Outcomes	**Cognitive Level**
At the end of the course students will be able to:	
CO1. Explain electrical & electronics engineering drawings, documents and standards	Understand
CO2. Prepare PCB engineering documents for the given electronic circuit as per industry standards	Apply
CO3. Prepare electrical wiring diagram and wiring harness drawing as per industry standards	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	1	1	1	1	1	-	-	-	-
CO2	2	-	-	-	-	-	-	-	1	1	-	-	1	1
CO3	2	-	-	-	-	-	-	-	-	-	-	-	1	1

High-3; Medium-2; Low-1

Assessment Pattern:

	Assessment Component	**CO No**	**Marks**	**Total**
Continuous Assessment	Each Lab Experiment	1,2,3	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	2,3	50	
			Total	100

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Course Code:19PSHG3002		Course Title:Personal Effectiveness (Common to all B.E/B.Tech Programmes) (2019 Batch only)	
Course Category:Humanities		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0: 2	Credits:1	Total Contact Hours:30	Max Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Set SMART goals for academic, career and life
2. Identify strength, weaknesses and opportunities
3. Plan for achieving the goals
4. Apply time management techniques
5. Create time and pursue activities of self interest

Unit I The importance of envisioning

Importance of positive self-perception – Principle of dual creation (Everything gets created twice – Envisioning) - Understanding Vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people – Importance of goal setting – Importance of planning and working to time.

Unit II Fundamental principles of goal setting and working to time

Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume

Unit III Goal setting and action orientation

Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment – Importance of action orientation - Converting goals to actionable tasks – Establishing road map – Using Gantt chart for planning and progress

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Unit IV Time management - tools and techniques

Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination

Unit V Putting into practice

Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews

Course Outcomes	**Cognitive/ Affective**
At the end of this course, students will be able to:	
CO1:Identify the strengths, weaknesses and opportunities	Apply
CO2:Set well-articulated goals for academics, career, and personal aspirations	Apply
CO3:Establish the road map to realize the goals	Apply
CO4:Apply time management techniques to complete planned tasks on time	Apply
CO5:Create time and pursue activities of self-interest that add value	Value

Text book(s):

T1. Reading material, workbook and journal prepared by PS team of the college.

Reference(s):

R1. Stephen R Covey, "First things first", Simon & Schuster U.K, Aug 1997.

R2. Sean Covey, "Seven habits of highly effective teenagers", Simon & Schuster U.K, 2004.

Course offering:

Orientation programme (2 days)	CO1 and CO2
Student practice (weekly review classes)	CO3
Student journal writing (interim reviews)	CO4 and CO5

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Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	1	-	1	1	-	1	-	-
CO2	-	-	-	-	-	-	1	-	-	-	1	1	-	-
CO3	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	1	1	-	-	-
CO5	-	-	-	-	-	1	1	-	-	-	-	1	-	-

High-3; Medium-2;Low-1

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Course Code:19PSHG6001		Course Title:Wellness for Students (Common to all B.E/B.Tech Programmes) (2020 Batch onwards)	
Course Category: Humanities		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0: 2	Credits:1	Total Contact Hours:30	Max. Marks:100

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Set SMART goals for academic, career and life
2. Apply time management techniques
3. Articulate the importance of wellness for success in life.
4. Understand the dimensions of wellbeing and relevant practices

Unit I Goal Setting

Understanding Vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people. Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume. Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment.

Unit II Time Management - Tools and Techniques

Importance of planning and working to time. Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination

Unit III Practices for Physical Wellness

Concept of wellness – impact of absence of wellness - Wellness as important component to achieve success. Wellbeing as per WHO - Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods

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Simplified Physical Exercises. Fitness as a subset of Wellness – health related physical fitness - skill related physical fitness. Joint movements, Warm up exercises, simple asanas, WCSC simplified exercises.

Unit IV **Practices for Mental Wellness**

Meditation: Mind and its functions - mind wave frequency – Simple basic meditation – WCSC meditation and introspection tables. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.

Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas

Unit V **Putting into Practice**

Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews.

Course Outcomes	**Cognitive/ Affective**
At the end of this course, students will be able to:	
CO1. Set well-articulated goals for academics, career, and personal aspirations	Apply
CO2. Apply time management techniques to complete planned tasks on time	Apply
CO3. Explain the concept of wellness and its importance to be successful in career and life	Apply
CO4. Explain the dimensions of wellness and practices that can promote wellness	Apply
CO5. Demonstrate the practices that can promote wellness	Valuing

Text book(s):

T1. Reading material, workbook and journal prepared by PS team of the college.

Reference Book(s):

R1. Stephen R Covey, "First things first", Simon & Schuster Uk, Aug 1997.
R2. Sean Covey, "Seven habits of highly effective teenagers", Simon & Schuster Uk, 2004.
R3. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar, "Value education for harmonious life (Manavalakalai Yoga)", Vethathiri Publications, Erode, I Edition. (2010).
R4. Dr. R. Nagarathna, Dr.H.R. Nagendra, "Integrated approach of yoga therapy for positive health", Swami Vivekananda Yoga Prakashana, Bangalore, Edition(2008).
R5. Tony Buzan, Harper Collins, The Power of Physical Intelligence (English).

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Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	1	1	-	1
CO2	-	-	-	-	-	-	-	-	1	-	1	1
CO3	-	-	-	-	-	-	-	-	1	-	-	1
CO4	-	-	-	-	-	-	-	-	1	-	-	1
CO5	-	-	-	-	-	1	1	-	1	-	-	1

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Personal Effectiveness	1,2,5	35	75
	Yoga and physical Exercise:	3,4,5		
	Physical Exercises		20	
	Meditation		10	
	Assessment of student's workbook		10	
End Semester Examination	Written test (MCQ and short answers)	1,2,3,4,5	30	Marks out of 100 is reduced to 25
	Physical exercises		50	
	Viva-voce		20	
			Total	100

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Course Code:19CHMG6201	Course Title: Environmental Sciences (Common to all B.E/B.TechProgrammes)	
Course Category: Mandatory Non-CreditCourse	Course Level: Introductory	
L:T:P(Hours/Week)1: 0: 0	Total Contact Hours:15	Max. Marks: 100

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Create awareness for conservation and equitable use of natural resources.
2. Explain the measures of prevention of pollution and disaster management.
3. State the importance of environmental legislation in India.
4. Expose the general environmental issues relevant to human health.
5. Explain the innovative measures for day to day environmental issues.

Unit I Natural Resources 2 Hours

Role of individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

Unit II Environmental Pollution and Disaster Management 2 Hours

Role of an individual in prevention of pollution; Disaster management : floods, earthquake, cyclone and landslides.

Unit III Environmental Ethics and Legislations 2 Hours

Environmental ethics : Environment Protection Act; Air Act; Water Act ; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation.

Unit IV Environmental Issues and Public Awarness 2 Hours

Public awareness - Environment and human health

Unit V Environmental Activities 7 Hours

(a) Awareness Activities:

i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste

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ii) Slogan making event
iii) Poster making event

(b) Actual Activities:

i) Plantation
ii) Cleanliness drive
iii) Drive for segregation of waste
iv)To know about the different varieties of plants
v) Shutting down the fans and ACs of the campus for an hour or so

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the measures for conservation and equitable use of natural resources	Understand
CO2: Describe the measures for pollution prevention and disaster management	Understand
CO3: Brief the importance of environmental legislation in India	Understand
CO4: Explain the general environmental issues in relevant to human health	Understand
CO5: Demonstrate innovative measures for day to day environmental issues	Understand

Text Book(s):

T1.Benny Joseph, "Environmental Studies", Tata McGraw Hill, New Delhi, 2006.

T2.Mackenzie Davis and Susan Masten, "Principles of environmental engineering and science", Mc-Graw Hill, 3rd Edition, 2014.

Reference Book(s):

R1.Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances andStandards", Vol.I and II, Enviro Media.

R2.Cunningham, W.P.Cooper,T.H. Gorhani, "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO2	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO3	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO4	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO5	1	-	-	-	-	-	-	2	1	2	-	-	-	-

High-3; Medium-2; Low-1

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Assessment Pattern

Component	Marks	Details
Attendance	10	Minimum 80% and 1 mark for every 2% observed
Knowledge Test	40	Objective type questions
Activity(ies)	50	Report on the activity performed
Total	**100**	

Non-letter Grades

Marks Scored	Performance Level
70 & above	Good
30 – 69	Average
< 30	Fair

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Semester III

Course Code: 19MABC1302	Course Title: Numerical Methods and Linear Algebra (Common to EC, EE & EI)		
Course Category: Basic Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

- Matrices and Calculus
- Ordinary Differential Equation and Complex variables

Course Objectives

The course is intended to:

1. Solve the system of linear equations, nonlinear equations and calculate the dominant Eigen value
2. Determine the unknown values from the given set of data & Compute derivatives and integrals
3. Solve first ordinary differential equation
4. Apply the concept of vector spaces to electrical network problems
5. Apply the concept of Inner product spaces in Fourier approximation

Unit I **Solution of Equations and Eigen value Problems** **9+3 Hours**

Solution of system of linear equations – Direct methods: Gaussian elimination method – Indirect methods: Gauss Jacobi method, Gauss-Seidel method – sufficient conditions for convergence – Solution of nonlinear equations: Newton Raphson method – Power method to find the dominant Eigen value and the corresponding Eigen vector. Application of Eigen value and the corresponding Eigen vector.

Unit II **Interpolation, Numerical Differentiation and Integration** **9+3 Hours**

Newton's forward, backward interpolation — Lagrange's interpolation. Numerical Differentiation and Integration — Trapezoidal rule — Simpson's 1/3 rule — Double integration using Trapezoidal rule.

Unit III **Numerical Solution of Ordinary Differential Equation** **9+3 Hours**

Numerical solution of first order ordinary differential equation-Single step method: Taylor's series- Euler's method - Runge-Kutta method of fourth order — Multi step method: Milne's and Adams – Bash forth predictor corrector methods for solving first order equations.

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Unit IV Vector Spaces **9+3 Hours**

System of linear equations -Vector spaces- Subspace of a vector space- basis and dimension of vector space - linear combination and spanning sets of vectors -linear independence and linear dependence of vectors-Row space, Column space and Null space- Rank and nullity of subspaces. Applications to linear equations: Simple electrical network problems to find loop current using Kirchhoff's voltage law.

Unit V Orthogonality and Inner Product Spaces **9+3 Hours**

Inner product of vectors: length of a vector, distance between two vectors, and orthogonality of vectors-Orthogonal projection of a vector-Gram-Schmidt process to produce orthogonal and orthonormal basis -Inner product spaces- Fourier approximation of continuous functions using inner product spaces.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Solve the system of linear equations, nonlinear equations and calculate the dominant Eigen value	Apply
CO2: Determine the unknown values from the given set of data and compute derivatives and integrals	Apply
CO3: Solve first ordinary differential equation	Apply
CO4: Apply the concept of vector spaces to electrical network problems	Apply
CO5: Apply the concept of Inner product spaces in Fourier approximation	Apply

Text Book(s):

T1. Grewal, B.S. and Grewal, J. S., "Numerical Methods in Engineering and Science", 11th Edition, Khanna Publishers, New Delhi, 2013.

T2. David C Lay, "Linear Algebra and its Applications', 5th Edition, Pearson Education, 2015.

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Reference Book(s):

R1. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 7th Edition, Pearson Education Asia, New Delhi, 2006.

R2.Jain M. K., Iyengar, S. R. and Jain, R. K, "Numerical Methods for Scientific and Engineering Computation', New Age Publishers, 2012.

R3. Sastry.S.S "Introductory Methods of Numerical Analysis", 3rd Edition, PHI, 2003.

R4. Gilbert Strang, "Linear algebra and its Applications', 4th Edition, Cengage Learning India Private Limited, 2012.

Web References:

1. http://nptel.ac.in/courses/122104018/node2.html
2. http://nptel.ac.in/courses/111105038/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	2	2	3	-	3	-	-
CO2	2	-	-	-	-	-	-	2	2	3	-	3	-	-
CO3	2	-	-	-	-	-	-	2	2	3	-	3	-	-
CO4	2	-	-	-	-	-	-	2	2	3	-	3	-	-
CO5	2	-	-	-	-	-	-	2	2	3	-	3	-	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	Tutorial/ Quiz/ Assignment	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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Course Code: 19EECN1301	Course Title: DC Machines and Transformers		
Course Category: Professional Core		Course Level: Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

- Introduction to Engineering
- Physics for Electrical Sciences

Course Objectives

The course is intended to:

1. Learn about the construction, operation and characteristics of DC generators
2. Study about the construction, operation and characteristics of DC motors
3. Impart knowledge on speed control of DC motors and testing of DC machines
4. Study about the single phase transformers and auto transformers
5. Impart knowledge on three phase transformers and testing of transformers

Unit I DC Generators **9 Hours**

Principle of electromechanical energy conversion - Constructional features of a DC machine – Principle of operation – EMF equation – Methods of excitation: Self and separately excited generators – Characteristics: series, shunt and compound generators - applications – armature reaction - commutation – Parallel operation of shunt and compound generators.

Unit II DC Motors **9 Hours**

Principle of operation – Back EMF and torque equation – Characteristics: series, shunt and compound motors – applications – losses and efficiency – Necessity of starter - 3point and 4 point starter.

Unit III Speed Control and Testing Of DC Machines **9 Hours**

Speed control: DC series and shunt motors – Electrical Braking: Plugging, Dynamic and Regenerative braking - Testing of DC Machines: Brake Test, Swinburne's test, Hopkinson's test and Retardation test.

Unit IV Transformers **10 Hours**

Constructional details of core and shell type transformers – Principle of operation – EMF equation – Transformation ratio –Transformer on no load – Transformer on load - Equivalent circuit – Regulation – Losses and efficiency – Condition for maximum efficiency – All day

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efficiency - Parallel operation of single phase transformers – Auto transformer – Comparison with two winding transformers.

Unit V **Three phase Transformers and testing of Transformers** **8 Hours**

Three phase transformer constructional features – Three phase transformer connections. Testing of transformers: Polarity and voltage ratio tests, Load test, Open circuit and short circuit test, Sumpner's test and Separation of No load losses.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the constructional details of DC machine, operation and performance of DC generators	Understand
CO2: Describe the operation, characteristics and applications of DC motors	Understand
CO3: Explain the speed control & braking of DC motor and various tests to determine the performance of DC machines	Understand
CO4: Explicate the construction, operation and performance of single phase transformers	Understand
CO5: Explain the different tests to determine the performance of transformers and three phase transformer construction & its connections	Understand

Text Book(s):

T1. Nagrath I.J Kothari D.P, "Electric Machines", Tata McGraw Hill Publishing Company Ltd, 5th Edition, 2017.

T2. MurugeshKumar.K, "Electrical Machines Volume - I", Vikas Publishing House Pvt. Ltd, 1st Edition, 2010.

Reference Book(s):

R1. Bimbhra. P.S, "Electric Machines", Khanna Publishers, 2nd Edition, 2017.

R2. Gupta. J.B, "Theory and Performance of Electrical Machines", S.K.Kataria and Sons, 4th Edition, 2013.

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R3. S.K. Bhattacharya, "Electric Machines", Tata McGraw Hill Publishing Company Ltd, 4th Edition, 2017.

R4. A.E.Fitzgerald, Charles Kingsley, Stephen.D.Umans, "Electric Machinery", TataMcgraw Hill Publishing Company Ltd, 6th Edition, 2017.

R5. V.K Mehta, Rohit Mehta, "Principle of Electrical Machines", S.Chand Publishing, 2014.

Web References:

1. http://nptel.ac.in/courses/108105017/
2. http://www.nptelvideos.in/2012/11/electrical-machines-i.html
3. http://www.nptelvideos.com/electrical_engineering/

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	-	2	-	-	1	1
CO2	1	-	-	-	-	-	-	2	-	2	-	-	1	1
CO3	1	-	-	-	-	-	-	2	-	2	-	-	1	1
CO4	1	-	-	-	-	-	-	2	-	2	-	-	1	1
CO5	1	-	-	-	-	-	-	2	-	2	-	-	1	1

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorial/ Quiz/ Assignment	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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HOD-Electrical and Electronics Engineering
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Course Code: 19EECN1302	Course Title: Electric Circuits		
Course Category: Professional Core		Course Level: Introductory	
L:T:P(Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

- Electron Devices

Course Objectives

The course is intended to:

1. Compute the various electric circuit parameters using circuit reduction, mesh and node analysis
2. Apply the concept of network reduction technique to DC and AC circuits
3. Explain the concept of Resonance and simple coupled circuits
4. Apply Laplace transformation technique to obtain the transient responses of RL, RC, RLC circuits
5. Explain the various three phase circuits behavior with balanced and unbalanced three phase loads

Unit I Basic Circuit Analysis **9+3 Hours**

Review of Kirchhoff's laws - series and parallel circuits, equivalent resistance, Source transformation, star/delta conversion. Concepts of AC circuits – RMS value, average value, form and peak factors – real and reactive power – power factor-Mesh current and Node voltage methods of analysis for D.C and A.C circuits.

Unit II Circuit Theorems for DC And AC Circuits **9+3 Hours**

Thevenin's and Norton's Theorem- Superposition Theorem — Maximum power transfer theorem – Reciprocity Theorem

Unit III Resonance and Coupled Circuits **9+3Hours**

Resonance: Series and Parallel - Quality factor, Resonant frequency, bandwidth and their relations. Effect of variation of Q on resonance.

Coupled circuits: Mutual inductance – Coefficient of coupling – dot convention – analysis of simple coupled circuits. Series and parallel connections of coupled coils

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Unit IV Transient Response **9+3Hours**

Source free response of RL and RC circuits – Source free response of RLC circuit Forced (step) response of RL and RC circuits — Forced (step) response of RLC circuit – Forced response of RL RC and RLC circuit to sinusoidal excitation.

Unit V Three Phase Circuits **9+3 Hours**

Three phase balanced / unbalanced voltage sources – Analysis of three phase 3 wire and 4 wire circuits with star and delta connected loads, balanced and unbalanced – phasor diagram of voltage & currents – Power and power factor measurements in three phase circuits.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Compute the various electric circuit parameters using circuit reduction, mesh and node analysis	Understand
CO2: Apply the concept of network reduction technique to DC and AC circuits	Apply
CO3: Explain the concept of Resonance and simple coupled circuits	Understand
CO4: Apply Laplace Transformation technique to obtain the transient responses of RL, RC, RLC circuits	Apply
CO5: Explain the various three phase circuits behavior with balanced and unbalanced three phase loads	Apply

Text Book(s):

T1. William H. Hayt, Jack Kemmerly, Steven M. Durbin. "Engineering Circuit Analysis" Tata McGraw-Hill, New Delhi, 8th Edition, 2013.

T2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Tata McGraw-Hill, New Delhi,6th Edition, 2019.

Reference Book(s):

R1. Chakrabati A, "Circuits Theory (Analysis and synthesis), DhanpatRai& Sons, New Delhi, 7th Edition,2018.

R2. M Nahvi, Joseph Edminister, K UMA RAO "Electric circuits", Schaum'sSeries,Tata McGraw-Hill, New Delhi, 5th Edition, 2010..

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R3. Robert L. Boylestad, "Introductory Circuit Analysis" Pearson, USA, 16th Edition, 2016.
R4. A. Sudhakar,Shyammohan S Palli, "Circuits and Networks Analysis and Synthesis"Tata McGraw-Hill, New Delhi, 5th Edition,2015.
R5. Dr. M. Arumugam, N.Premkumar, "Electric circuit theory"Khanna Publishers, New Delhi, 5th Edition,2002.

Web References:

1. https://nptel.ac.in/courses/108102042/
2. https://nptel.ac.in/courses/117106108/
3. https://nptel.ac.in/courses/108102097/

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	1	1	2	-	1	1	-
CO2	2	-	-	-	-	-	-	1	1	2	-	1	1	-
CO3	1	-	-	-	-	-	-	1	1	2	-	1	1	-
CO4	2	-	-	-	-	-	-	1	1	2	-	1	1	-
CO5	2	-	-	-	-	-	-	1	1	2	-	1	1	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	Tutorial/ Quiz/ Assignment	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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Course Code: 19EECC2301	Course Title: Digital Electronics (Common to EE and EI)		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week): 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Pre-requisites

- Electron Devices

Course Objectives

The course is intended to:

1. Illustrate the number systems, Boolean laws and simplification techniques
2. Design Combinational circuits
3. Design synchronous sequential circuits
4. Design asynchronous sequential circuits
5. Explain the various memory devices, shift registers and logic families

Unit I **Number System and Boolean Algebra** **9 Hours**

Review of Number Systems-Complements: 1's and 2's- Arithmetic operation of Signed binary numbers-Boolean Algebra: Basic theorems, Simplification of Boolean functions, Representation of Boolean function in canonical and standard forms-Simplification of Boolean expressions using K maps and Quine Mccluskey method.

Unit II **Combinational Circuits** **9 Hours**

Basic Gates, Universal gate implementation, Design of Adder, Subtractor, Comparators, Code converters, Encoders, Decoders, Multiplexers, De-multiplexers- Function realization using multiplexer.

Unit III **Synchronous Sequential Circuits** **9 Hours**

Flip Flops: SR,JK, T, D- Level and Edge Triggering- Analysis of Synchronous sequential circuits-Design of Synchronous sequential circuits with state diagram, state table, state reduction and state assignment- Design of counter.

Unit IV **Asynchronous Sequential Circuits** **9 Hours**

Analysis of Asynchronous Sequential Circuits-Design of Asynchronous sequential circuits with primitive flow table, State Reduction and State Assignment- Races, Cycles and Hazards: Static, Dynamic, Essential, Hazards Elimination.

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Unit V **Memory Devices, Shift registers and Logic Families** **9 Hours**

Memories: ROM, PROM, EPROM – FPGA -Shift registers – Ripple counters – Logic families: TTL, ECL, CMOS.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Illustrate the number systems, Boolean laws and simplification techniques used in digital design	Understand
CO2: Develop the combinational circuits using logic gates	Apply
CO3: Develop the synchronous sequential circuits using basic flip flops	Apply
CO4 :Develop the asynchronous sequential circuits eliminating hazards and races	Apply
CO5: Explain the various memory devices, shift registers and logic families	Understand

Text Book(s):

T1. A.Anandkumar, Fundamentals of digital circuits, 4thEdition, PHI Learning Pvt Ltd, 2016

T2. John F.Wakerly, Digital Design Principles and Practice, Pearson Education, 5th edition, 2018.

Reference Book(s):

R1. Malvino and Leach, Digital Principles and Applications, Tata McGraw Hill, New Delhi, 8th Edition, 2014.

R2. S.Salivahanan and S. Arivazhagan, Digital Circuits and Design, Oxford University Press, 5th Edition, 2018.

R3. Morris Mano. M. Michael D Ciletti, "Digital Design", Pearson Education, 4th Edition, 2008.

R4. John M.Yarbrough, Digital Logic, Application & Design, Thomson, 2010.

R5. Donald D. Givone, "Digital Principles and Design", TMH,2003.

Web References:

1. https://nptel.ac.in/courses/117105080/
2. https://nptel.ac.in/courses/117106086/

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Laboratory Component **30 Hours**

1. Simplification of Boolean Expression using K map and its implementation
2. Design of full adder/ full subtractor using logic gates
3. Design of encoder/ decoder using logic gates
4. Design of multiplexer using logic gates
5. Design of basic flip flops
6. Design of shift registers

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	1	1	-	-	1	2	3	-	-	2	-
CO2	2	1	-	2	2	-	-	1	2	3	-	-	2	-
CO3	2	1	-	2	2	-	-	1	2	3	-	-	2	-
CO4	2	1	-	2	2	-	-	1	2	3	-	-	2	-
CO5	1	1	-	1	1	-	-	1	2	3	-	-	2	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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HOD-Electrical and Electronics Engineering
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Course Code: 19EECN2301	Course Title: Instrumentation and Testing		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain the fundamental concepts of measurements
2. Understand the measurement of electrical quantities
3. Understand the measurement of physical quantities and functioning of display devices.
4. Describe the data acquisition and storage devices
5. Explain the test concept of virtual instrumentation and test procedures

Unit I Basics of Measurements **9 Hours**

SI Units, Standards, Functional elements of an instrument, Static and Dynamic characteristics – Errors. PMMC and MI Instruments: Construction - Working - Errors – D Arsonval Galvanometer: Construction - Working - Errors.

Unit II Electrical Quantity Measurements **9 Hours**

Bridges: Wheatstone's bridge, Maxwell bridge, Schering bridge and Wein bridge.

Potentiometers: Crompton potentiometer and drysdale polar potentiometers - Watt meter - Single phase energy meter, Power factor meter, LCR Meter - Instrument transformers.

UNIT III Physical Quantity Measurements and Display Devices **9 Hours**

Classification of transducer – Selection and specification of transducers – Resistive, Capacitive and Inductive transducers – Piezoelectric and Optical transducer. Display Devices: CRT Display, digital CRO, DSO, LED, LCD & Dot matrix display.

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Unit IV **Data Acquisition System and Storage Devices** **9 Hours**

Data acquisition system: components - signal conditioning – Sample and hold circuit - ADC – DAC. Storage devices: X-Y recorder, magnetic tape recorder, hard disk, CD ROM, USB drive.

Unit V **Virtual Instrumentation and Test Procedures** **9 Hours**

PC based instrumentation – Bed of nails fixtures. Introduction to LabVIEW environment - LabVIEW foundation – Signal acquisition using LabVIEW – Test procedure automation.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the fundamental concepts of measurements and measuring instruments.	Understand
CO2: Describe the measurement of various electrical parameters.	Understand
CO3 Illustrate the measurement of physical parameters and the concept of display devices.	Understand
CO4: Describe data acquisition system and storage devices.	Understand
CO5: Explain the fundamentals of virtual instrumentation and the test procedures.	Understand

Text Book(s):

T1. A K. Sawhney "A course in Electrical and Electronic Measurements and Instrumentation", Dhanbat Raj & Co., 2015.

T2. Handouts prepared by MCET team.

Reference Book(s):

R1. Alan V. Oppenheim, Alan S.Willsky, S.HamidNawab, "Signals & Systems", 2nd Edition, Prentice Hall, 2015.

R2. K. Lal Kishore and Kishore, "Electronic Measurements and Instrumentation", Pearson, 1st Edition, 2009.

R3. Jovithajerome, "Virtual Instrumentation Using LABVIEW", 2010, PHI learning Pvt ltd

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R4. Jose Moreira, Hubert Werkmann, "An Engineer's Guide to Automated Testing of High-Speed Interfaces", 2nd Edition, ARTECH house, 2010.

R5. Wilson, "Test and measurements: know it all", Newnes (imprint of Elsevier), 2009, Oxford,UK.

Web References:

1. https://www.sciencedirect.corn/science/article/pii/B9780123819604000073
2. https://www.sciencedirect.com/science/article/pii/B9780123819604000061
3. https://www.mclpcb.com/pcb-testing-methods-guide

Laboratory Component **30 Hours**

List of Lab Exercises

1. Measurement of R,L and C using bridges and RLC meter
2. (i) Measurement of electrical parameters Voltage and Current
   (ii) Measurement of Power and Energy
3. Measurement of physical parameters (Temperature, Pressure, Displacement)
4. Introduction to LabVIEW foundation
5. Development of signal conditioners and converters using LabVIEW
6. Development of data acquisition system using LabVIEW

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Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	1	1	-	-	1	2	3	-	-	1	-
CO2	1	1	-	1	1	-	-	1	2	3	-	-	1	-
CO3	1	1	-	1	1	-	-	1	2	3	-	-	1	-
CO4	1	1	-	1	1	-	-	1	2	3	-	-	1	-
CO5	1	1	-	1	1	-	-	1	2	3	-	-	1	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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HOD-Electrical and Electronics Engineering
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Course Code: 19EECN3301		Course Title: DC Machines and Transformers Laboratory	
Course Category: Professional Core		Course Level: Practical	
L:T:P(Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Prerequisites:

- Nil

Course Objectives

The course is intended to:

1. Compare the performance of DC generators
2. Compare the performance of DC motors
3. Predict the performance of DC machine
4. Determine the performance of single phase transformers
5. Predict the performance of single phase transformers

List of experiments:

1. Open circuit and load characteristics of self and separately excited DC shunt generators
2. Load characteristics of DC compound generator with differential and cumulative connection
3. Load characteristics of DC shunt and series motor by brake test
4. Speed control of DC shunt motor using armature and field control method
5. Predetermination of efficiencies as Generator and Motor from Swinburne's test
6. Hopkinson's test on DC motor-generator set
7. Load test on single phase transformer
8. Open circuit and short circuit tests on single phase transformer
9. Sumpner's test on transformers
10. Separation of no-load losses in single phase transformers

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Course Outcomes At the end of the course students will be able to:	Cognitive Level
CO1.Compare the performance of different types of DC generators	Apply
CO2.Compare the performance of different types of DC motors	Apply
CO3.Predict the performance of DC machine by indirect test	Apply
CO4.Determine the performance of single phase transformer by direct test	Apply
CO5.Predict the performance of single phase transformer by indirect test	Apply

Reference Book(s):

1. D.P.Kothari, B.S.Umre"Laboratory Manual for Electrical Machines",I.K.International Publishing House Pvt.Ltd,2017.
2. "DC Machines & Transformer Laboratory Manual" Prepared by Department of Electrical and Electronics Engineering.

Web References:

1. www.ee.iitkgp.ac.in/faci_em.php
2. www.eee.griet.ac.in/.../2014/12/DC-Machines-Lab-Manual.pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	2	2	-	-	-	2	2	-	-	-	-
CO2	2	1	-	2	2	-	-	-	2	2	-	-	-	-
CO3	2	1	-	2	2	-	-	-	2	2	-	-	-	-
CO4	2	1	-	2	2	-	-	-	2	2	-	-	-	-
CO5	2	1	-	2	2	-	-	-	2	2	-	-	-	-

High-3; Medium-2; Low-1

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Assessment Pattern

	Assessment Component	CO No	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

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Course Code: 19EECN4301	Course Title: Process Engineering in Electrical and Electronics Parts		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 1: 0: 3	Credits:2.5	Total Contact Hours:60	Max Marks:100

Prerequisites:

- Nil

COURSE OBJECTIVES

The course is intended to:

1. Prepare the process flow chart
2. Fabricate and assemble the identified Electrical part
3. Fabricate and assemble the PCB for the identified product
4. Fabricate and assemble the given wiring harness

UNIT I Process Flow Chart for Electrical/Electronic Component / Product **9+6 Hours**

Introduction to Process Engineering: Overview of manufacturing process- different process involved in manufacturing Electrical/Electronic components/products: transformer, PCB, wiring harness

Exercise:

1. Preparation of process flow chart for manufacturing of Electrical product.
2. Preparation of process flow chart for manufacturing of Electronic product.
3. Preparation of process flow chart for manufacturing of wiring harness.

UNIT II Fabrication And Assembly of Electrical Part/Component **3+12 Hours**

Fundamental and working principle of transformer: EMF Equation, Construction of transformer: primary and secondary winding, Types of Winding – Semi automatic

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winding, Manual winding, Automatic winding; Types of Insulation - Mylar tape, Impregnated paper – Types of cores – Standards.

Exercise:

[Construct 230 /12V, 500mA transformer as per the prepared process flow chart and test it]

4. Practice coil winding 230 /12V, 500mA transformer as per the prepared process flow chart.

5. Practice core assembly of 230 /12V, 500mA transformer as per the prepared process flow chart.

6. Perform basic test on the assembled transformer.

UNIT III Fabrication And Assembly of Electronic Part/Component 3+12 Hours

BOM – Assembly process: Manual assembly process, automated assembly process- types of soldering: Manual soldering, wave soldering, reflow soldering - Types of PCB- Manufacturing steps: component placement and orientation, IPC Standards for assembly- Interpret the data sheets and standards.

Exercise:

[Fabricate and assemble the target PCB as per the derived flow chart using the data sheet and standards]

7. Practice soldering /de-soldering of components in the given PCB.

8. PCB fabrication for the given product.

9. Perform subsystem integration and testing of the given product

UNIT IV Design and manufacture the Wiring Harness 3+12 Hours

Design parameters: wiring harness and its associated terms, loads, operating conditions, safety and regulatory requirements - harnessing types- Computer aided

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design (CAD) skill and scope for wiring harness- Wiring harness layout requirements, Test requirements- Wiring harness manufacturing & testing process: Manufacturing design & BOM, pre harnessing process & final laying board, Post harnessing process & tests.

Exercise:

10. Fitting the wires in form board

11. Practice wire crimping

12. Practice connector selection, dismantling and assembling connector accessories

Course Outcomes	**Cognitive Level**
At the end of the course students will be able to:	
CO1. Prepare the process flow chart for the given Electrical/Electronic component / Product	Understand
CO2. Fabricate and assemble the identified Electrical part/component – Transformer	Apply
CO3. Fabricate and assemble the PCB for identified product	Apply
CO4.Design and manufacture the wiring harness	Apply

References:

R1. Manual prepared by Caresoft Global manual.

R2. Manual prepared by Department of Electrical and Electronics Engineering.

R3. R. S. Khandpur, "Printed circuit Board Design, Fabrication, Assembly and Testing", 2017.

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Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	1	1	-	-	-	2	2	-	-	-	-
CO2	2	1	-	2	2	-	-	-	2	2	-	-	1	1
CO3	2	1	-	2	2	-	-	-	2	2	-	-	1	1
CO4	2	1	-	2	2	-	-	-	2	2	-	-	1	1

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO No	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4	50	
			Total	100

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Course Code: 19PSHG6002		Course Title: Universal Human Values 2 :Understanding Harmony (Common to all B.E/B.Tech Programmes)	
Course Category: Humanities		Course Level: Practice	
L:T:P (Hours/Week) 2:1: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

- Induction Program (UHV 1)

Course Objectives

The course is intended to:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Strengthening of self-reflection
3. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
4. Development of commitment and courage to act

Unit I Introduction to Value Education **6+3 Hour**

Need for the Value Education; Self -exploration as the process for value education ; Continuous Happiness and Prosperity: A look at basic Human Aspirations; Right understanding: Relationship and Physical Facilities ; Happiness and Prosperity: current scenario ; Method to fulfill the Basic human aspirations

Unit II Harmony in Human Being **6+3 Hour**

Human being as a co-existence of self ('I') and the material 'Body'; needs of Self ('I') and 'Body'; The Body as an instrument of 'I'; Harmony in the self ('I'); Harmony of the self ('I') with body; Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Unit III Harmony in the Family and Society **6+3 Hour**

Harmony in the Family the basic unit of human interaction; Values in human to human relationship; Trust as the foundational values of relationship; Respect as the right evaluation ;Understanding harmony in the society (society being an extension of family); Vision for the universal human order

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Unit IV Harmony in the Nature **6+3 Hour**

Understanding the harmony in the Nature Interconnectedness, self-regulation and mutual fulfillment among the four orders of nature; Existence as Co-existence at all levels; Holistic perception of harmony in existence.

Unit V Harmony on Professional Ethics **6+3 Hour**

Natural acceptance of human values ;Definitiveness of Ethical Human Conduct; Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics ;Case study: holistic technologies, management models and production systems ;Strategy for transition towards value based life and profession

Course Outcomes	**Affective Level**
At the end of this course, students will be able to:	
CO1.Reflect on values, aspiration, relationships and hence identify strengths and weaknesses.	Responding
CO2.Appraise physical, mental and social wellbeing of self and practice techniques to promote wellbeing.	Responding
CO3.Value human relationships in family and society and maintain harmonious relationships.	Valuing
CO4.Respect nature and its existence for survival and sustainable of all life forms and hence practice conservation of nature	Valuing
CO5.Appreciate ethical behaviour as a result of value system in personal and professional situations	Receiving

Text Book(s):

T1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference Book(s):

R1.Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3. The story of stuff, Annie Leonard, Free Press, New York 2010.

Web References:

1. https://aktu.ac.in/hvpe/ResourceVideo.aspx

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2. http://hvpenotes.blogspot.com/
3. https://nptel.ac.in/courses/109/104/109104068/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	1	2	2	-	-	2
CO2	-	-	-	-	-	1	2	2	2	1	-	2
CO3	-	-	-	-	-	2	2	2	2	1	-	2
CO4	-	-	-	-	-	2	2	2	2	-	-	2
CO5	-	-	-	-	-	1	2	2	2	-	-	2

High-3; Medium-2; Low-1

Assessment Pattern

As per AICTE guidelines, the following are the assessment pattern prescribed:

1. **Socially relevant project/Group Activities/ Assignments: 20 marks**
   a. One assignment per Module with 20 marks each
   b. Average of all assignments
2. **Assessment by faculty mentor: 10 marks**
   a. Based on attendance and engagement
3. **Self-assessment: 10 marks**
   a. Based on individual behavioural change: Case study of their own
4. **Assessment by peers: 10 marks**
   a. Based on 2 friends about their behavioural change
5. **Semester End Examination: (3 hours) 50 marks**
   a. Part A – Objective type – 20x 1 = 20 marks
   b. Part B – Short answer questions – 15x 2 = 30 marks
   c. Part C – Descriptive Type Questions (Either or Pattern) – 5 x 10 = 50 marks
   d. Total 100 marks reduced to 50 marks.

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SEMESTER IV

Course Code: 19MABG1401	Course Title: Probability and Statistics (Common to all B.E/B.Tech Programmes)		
Course Category: Basic Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Calculate expectations and variances of random variables
2. Apply the concepts of standard distributions to solve practical problems
3. Calculate the correlation and regression for two variables
4. Test the samples based on hypothesis
5. Analyze the samples based on variance

UNIT I PROBABILITY AND RANDOM VARIABLES **9+3 Hours**

Axioms of Probability- Conditional Probability- Total Probability -Baye's Theorem- Random Variables- Probability Mass Function- Probability Density Functions- Properties - Moments- Moment generating functions and their properties.

UNIT II STANDARD DISTRIBUTIONS **9+3Hours**

Binomial- Poisson- Uniform –Exponential- Normal Distributions and their properties-Functions of a random variable.

UNIT III TWO DIMENSIONAL RANDOM VARIABLES **9+3Hours**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression – Transformation of random variables.

UNIT IV TESTING OF HYPOTHESES **9+3 Hours**

Sampling Distributions- Testing of hypotheses for mean, variance, proportions and differences using Normal, t, Chi-Square and F distributions – Tests for independence of attributes and Goodness of fit.

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UNIT V DESIGN OF EXPERIMENTS **9+3 Hours**

Analysis of Variance (ANOVA)- One way Classification – Completely Randomized Design(CRD) – Two way Classification – Randomized Block Design (RBD) – Latin square.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1:Calculate expectations and variances of random variables	Apply
CO2: Apply the concepts of standard distributions to solve practical problems	Apply
CO3: Calculate the correlation and regression for two variables	Apply
CO4: Test the samples based on hypothesis	Apply
CO5: Analyze the samples based on variance	Apply

Text Book(s):

1. Veerarajan T, "Probability, Statistics and Random process", 4th Edition, Tata McGraw-Hill, New Delhi, 2013.
2. Dr.J.Ravichandran, "Probability and Statistics for Engineers", 1st Edition, Wiley India Pvt.Ltd.,2010.

Reference Book(s):

1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition Pearson Education, Asia, 2016.
2. M.R. Spiegel,J. Schiller and R.A. Srinivasan, "Schaum's Outlines Probability and Statistics", 3rdEdition,Tata McGraw Hill Edition, 2009.
3. Morris DeGroot, Mark Schervish, "Probability and Statistics", Pearson Educational Ltd, 4th Edition, 2014.
4. Johnson and C.B. Gupta,"Probability and Statistics for Engineers", 9th Edition,Pearson Education, Asia, 2016.

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Web References:

1. https://onlinecourses.nptel.ac.in/111105041/
2. https://nptel.ac.in/downloads/111105041/
3. https://nptel.ac.in/courses/111105090/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	2	2	3	-	3	-	-
CO2	2	-	-	-	-	-	-	2	2	3	-	3	-	-
CO3	2	-	-	-	-	-	-	2	2	3	-	3	-	-
CO4	2	-	-	-	-	-	-	2	2	3	-	3	-	-
CO5	2	-	-	-	-	-	-	2	2	3	-	3	-	-

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	Tutorial/ Quiz/ Assignment	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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HOD-Electrical and Electronics Engineering
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Course Code: 19EECN1401	Course Title: Synchronous and Induction Machines		
Course Category: Professional Core		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks:100

Pre-requisites

The student should have undergone the course(s):

- DC Machines and Transformers

Course Objectives

The course is intended to:

1. Explain the terminology, principles and theory of operation of Synchronous generators
2. Explain the working, performance and applications of Synchronous motors
3. Interpret the construction types, losses, efficiency and parameters of Induction motors
4. Select the different starting and speed control methods of Induction motor
5. Discuss the construction, principle of operation and applications of single phase motors

Unit I **Alternator** **11 Hours**

Introduction – Construction – Types - stationary armature - EMF equation – armature reaction – voltage regulation – pre-determination of regulation by EMF, MMF, and ZPF methods. Load characteristics – parallel operation – synchronizing torque, reactance and reluctance power – load sharing – alternator on infinite bus bar – two reaction theory – predetermination of voltage regulation for salient pole machines.

Unit II **Synchronous Motor** **8 Hours**

Theory of operation – phasor diagrams - variations of current and power factor with excitation – selection of starting methods – hunting and methods of suppression – power angle relations – V and inverted V curves – application - synchronous condenser.

Unit III **Three Phase Induction Motor** **10 Hours**

Constructional details – types of rotors – principle of operation – production of RMF – torque equation – torque slip characteristics – maximum torque – slip for maximum power – effect of rotor resistance – losses and efficiency - induction generators: PMSG, PMSM - performance calculation: equivalent circuit, testing – load test – no load and blocked rotor tests, circle diagram – separation of no load losses - Application.

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Unit IV **Starting And Control of Three Phase Induction motor** **8 Hours**

Selection of starting methods: DOL, stator resistance, auto transformer, rotor resistance and star–delta starters. Selection of speed control methods: Speed control by change of frequency, V/F ratio, number of poles and change of slip – Cogging – crawling - Electrical Braking: - plugging - regenerative and dynamic braking.

Unit V **Single Phase Motor** **8 Hours**

Constructional details of single phase induction motor – double field revolving theory – equivalent circuit. Selection of self-starting methods: Types of Single phase induction motor - Split phase, capacitor start, capacitor start capacitor run, permanent split capacitor, shaded pole starting methods – starting and running characteristics – applications - Hysteresis motor, Universal Motor - characteristics – applications.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the terminology, principles and theory of operation of synchronous Generator	Understand
CO2: Explain the working, performance and applications of synchronous motors	Understand
CO3: Interpret the construction types, losses, efficiency, parameters and applications of three phase induction motor	Understand
CO4: Select the different starting and speed control methods for three phase induction motors	Understand
CO5: Select the suitable type of single phase motor based on the application	Understand

Text Book(s):

1. Nagrath I.J Kothari D.P, "Electric Machines", Tata McGraw Hill publishing company Ltd, New Delhi, 3rd Edition,2010.
2. Murugesh Kumar, K, "Induction & Synchronous Machines", Vikas publishing house Pvt.Ltd.,Noida, 1st Edition, 2009.

Reference Book(s):

1. Bimbhra. P.S., "Electrical Machinery", Khanna Publishers, New Delhi, 7th Edition, 2011.
2. Gupta. J.B., "Theory and Performance of Electrical Machines", S.K. Kataria& Sons, New Delhi, 4th Edition, 2010.

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3. Theraja. B.L., Theraja. A.K. "A Textbook of Electrical Technology, Volume II(AC & DC Machines)", ,S.Chand& Company Ltd, New Delhi, 5th Edition, 2006.
4. A.E.Fitzgerald, Charles Kingsley, Stephen .D. Umans, "Electric Machinery", TataMcgraw Hill, New Delhi, 5th Edition, 2013.
5. V K Mehta & Rohit Mehta, "Principle of Electrical Machines", S. Chand Publishing, 2nd Edition, 2009.

Web References:

1. http://www.nptelvideos.in/2012/11/basic-electrical-technology.html
2. http://www.nptelvideos.in/2012/11/electrical-machines-i.html
3. http://www.nptel.ac.in/courses/108106072/

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	1	2	-	1	2	-
CO2	1	-	-	-	-	-	-	2	1	2	-	1	2	-
CO3	1	-	-	-	-	-	-	2	1	2	-	1	2	-
CO4	1	-	-	-	-	-	-	2	1	2	-	1	2	-
CO5	1	-	-	-	-	-	-	2	1	2	-	1	2	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	Tutorial/ Quiz/ Assignment	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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Course Code: 19EECN2401	Course Title: Electronic Circuits		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 2	Credits: 4	Total Contact Hours:75	Max Marks:100

Pre-requisites

- Electron Devices
- Electric Circuit Analysis

Course Objectives

The course is intended to:

1. Explain the operation of rectifier circuits and voltage regulators
2. Explain the need and types of biasing circuits
3. Model the small signal transistor amplifier using hybrid parameters
4. Classify the power amplifiers based on the location of operating point
5. Explain the operation of Oscillators and Multivibrators

Unit I Rectifier Circuits and Regulators **10 Hours**

Half wave, Full wave and Bridge rectifier – Average value, RMS value, Transformer Utilization factor, efficiency – Capacitive Filter; Voltage Regulators: Series regulator – Shunt regulator – Line regulation, Load regulation – Design of Zener diode regulator.

Unit II Biasing Circuits **8 Hours**

Need for Biasing - Factors affecting Stability of Q- point - Stability factors – Types of BJT Biasing circuits: Fixed Biasing, Feedback Bias, Voltage Divider Bias – Biasing of JFET and MOSFET- Voltage divider biasing.

Unit III Small Signal Transistor Amplifier **10 Hours**

Hybrid model of BJT, Graphical determination of hybrid parameters, Analysis of BJT amplifier: Common Emitter, Common Base – Design of single stage RC coupled amplifier using BJT – Frequency response of amplifier, Small signal model of FET amplifier.

Unit IV Large Signal Amplifiers **7 Hours**

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Comparison of Small signal and Large signal amplifier, Classification of Large Signal amplifier: Class A – Direct and Transformer coupled Class B – Push Pull, Complementary Symmetry amplifiers, Amplifier Distortion – Thermal Stability and heat sink.

Unit V **Oscillators and Wave shaping Circuits** **10 Hours**

Classification of Oscillators, Barkhausen Criterion, RC Oscillators: RC phase shift and Wien Bridge oscillators, LC Oscillators: Hartley and Colpitts Oscillators, Crystal Oscillators - Clippers and Clampers, Multivibrators: Astable, Monostable and Bistable Multivibrators.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the operation and parts of a regulated power supply	Understand
CO2: Explain the types of biasing circuits and the factors affecting the stability	Understand
CO3: Explain the analysis of small signal transistor amplifier using hybrid parameters	Understand
CO4: Classify the power amplifiers and explain their operation	Apply
CO5: Model the operation of oscillators and multivibrators	Apply

Text Book(s):

T1. Robert L Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 11th Edition, 2015.

T2. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, "Electronic Devices and Circuits" by, Tata McGraw Hill, New Delhi, 2nd Edition 2008.

Reference Book(s):

R1. Anil K.Maini, VarshaAgarwal, "Electronic Devices and Circuits", Wiley India Private Ltd, New Delhi, 1stEdition, 2015.

R2. David A. Bell, "Electronic Devices and Circuits", Oxford, 5thEdition, April 2008.

R3. Thomas L Floyd, "Electronic Devices" Pearson prentice hall, 10th Edition, 2017.

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R4. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.

R5. Streetman Ben G. and Banerjee Sanjay, "Solid State Electronic devices", PHI, 6thEdition, 2006.

Web References:

1. http://nptel.ac.in/video.php?subjectId=117103063

2. http://nptel.ac.in/video.php?subjectId=117106091

Laboratory Component **30 Hours**

List of Experiments

1. Half wave, Full wave rectifier and Bridge rectifier with and without capacitive filter
2. Frequency response of RC coupled amplifier
3. Clipping circuits and Clamping circuits
4. Series and Shunt voltage regulator
5. Simulation of Astable multivibrator using BJT
6. Simulation of Class B Complementary Symmetry power amplifier
7. Simulation of RC phase shift Oscillator using BJT

Reference Book:

1. Electronics Laboratory Lab manual prepared by Department of Electrical and Electronics Engineering.

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	1	1	-	-	1	2	3	-	1	1	-
CO2	1	1	-	1	1	-	-	1	2	3	-	1	1	-
CO3	1	1	-	1	1	-	-	1	2	3	-	1	1	-
CO4	2	1	-	2	2	-	-	1	2	3	-	1	1	-
CO5	2	1	-	2	2	-	-	1	2	3	-	1	1	-

High-3; Medium-2; Low-1

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BOS Chairman

HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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HOD-Electrical and Electronics Engineering
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Course Code: 19CSSC2401	Course Title: Data Structures and Algorithms (Common to EE,EI)		
Course Category: Engineering Science		Course Level: Practice	
L:T:P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max. Marks:100

Pre-requisites

- C Programming

Course Objectives

The course is intended to:

1. Design linear data structure
2. Implement Tree data structure
3. Implement Graph data structure
4. Demonstrate a familiarity with sorting in data structure
5. Apply suitable algorithm for searching and hashing techniques

UNIT I Linear Data structure **6 Hours**

Data Structures types - Abstract Data Types - List ADT: Array and Linked List Implementation - Stack ADT: Stack Model - Array Implementation of Stack –Queue ADT: Queue Model - Array Implementation of Queue

UNIT II Non Linear Data Structure: Tree **6 Hours**

Tree - Preliminaries - Binary tree - Tree traversal - Applications - Expression tree - Binary search tree – 2-3 Tree

UNIT III Non Linear Data Structure: Graph **6 Hours**

Representation of graph - Graph Traversals: Depth first and Breadth first traversal- Topological sort - Shortest path algorithms: Dijkstra's algorithms - Minimum Spanning Tree: Prim's and Kruskal's algorithms.

UNIT IV Sorting **6 Hours**

Simple Sorting Algorithms – Insertion sort -Shell Sort - Merge Sort – Quick Sort

External Sorting.

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UNIT V Searching and Hashing **6 Hours**

Linear Search – Binary Search – Hashing: Hash Functions – Separate Chaining – Open Addressing – Linear Probing – Quadratic Probing – Double Hashing.

List of Exercises **30 Hours**

1. Create a C program to implement Singly Linked list using Linked list implementation
2. Create a C program to implement Stack using array implementation
3. Create a C program to implement Queue using array implementation
4. Develop a C program to implement Binary search tree.
5. Develop a C program to implement Dijkstra's algorithm.
6. Create a C program to implement Merge Sort / Quick Sort / Bubble Sort

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Design Linear data structure such as Linked List, Stack and Queue using C	Apply
CO2: Implement Tree data structure for the given Scenario	Apply
CO3: Implement Tree data structure for the given application	Apply
CO4: Demonstrate a familiarity with sorting in data structures for a real time scenario	Apply
CO5: Apply suitable algorithm for searching and hashing techniques for given application	Apply

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Text Book(s):

T1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education Asia, New Delhi, 2011

Reference Book(s):

R1. Sahni, "Data Structures Using C, The McGraw-Hill, New Delhi, 2006.

R2. Michael.T.Goodrich, "Data Structures and Algorithm Analysis in C", Wiley student Edition, New Delhi, 2007

R3. Thomas H.Cormen, Charles E. Leiserson, Ronald L Rivest, Clifford Stein, "Introduction to Algorithms", MIT Press, England, 2009.

Web References:

1. https://www.coursera.org/specializations/data-structures-algorithms
2. http://www.csse.monash.edu.au/~lloyd/tildeAlgDS
3. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	2	2	-	-	1	2	3	-	-	-	-
CO2	2	1	-	2	2	-	-	1	2	3	-	-	-	-
CO3	2	1	-	2	2	-	-	1	2	3	-	-	-	-
CO4	2	1	-	2	2	-	-	1	2	3	-	-	-	-
CO5	2	1	-	2	2	-	-	1	2	3	-	-	-	-

High-3; Medium-2;Low-1

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Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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HOD-Electrical and Electronics Engineering
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Course Code: 19EECN3401	Course Title: Synchronous and Induction Machines Laboratory		
Course Category: Professional Core		Course Level: Practical	
L : T : P (Hours / Week) 0 : 0 : 3	Credits :1.5	Total Contact Hours : 45	Max Marks : 100

Prerequisites:

- DC Machines and Transformer Laboratory

Course Objectives

The course is intended to:

1. Acquire knowledge of three phase alternators
2. Demonstrate the parallel operation of alternator
3. Demonstrate the working of starters and speed control induction motor
4. Acquire knowledge of Synchronous motors
5. Acquire knowledge of induction motors

List of experiments:

1. Load test on three phase Alternator
2. Regulation of three phase alternator by EMF method
3. Regulation of three phase alternator by MMF method
4. Regulation of three phase salient pole alternator by slip test
5. Determination of V and Inverted V curves of Synchronous Motor
6. Demonstrate the working of different types of starters and speed control of three phase Induction Motor
7. Load test on single phase induction motor
8. Load test on three phase Squirrel cage and Slip-ring induction motor
9. No load and blocked rotor test on a three phase induction motor – Equivalent Circuit and Circle Diagram
10. Parallel operation of three phase alternators

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Course Outcomes		Cognitive Level
At the end of the course students will be able to:		
CO1.	Determine the performance of an alternator by direct and indirect method.	Apply
CO2.	Demonstrate the parallel operation of alternator and control of induction motor.	Understand
CO3.	Determine the synchronous motor's performance curves.	Apply
CO4.	Determine the performance of Synchronous motor.	Apply
CO5.	Determine the performance of Induction motor.	Apply

Reference Books

1. Gupta. J.B., "Theory and Performance of Electrical Machines", S. K. Kataria and Sons, 2010.
2. "Synchronous And Induction Machines Laboratory Manual" prepared by Department of Electrical and Electronics Engineering.
3. Bimbra P. S., Electrical Machinery, 7th Edition, Khanna Publishers, 2011.
4. Nagrath J. and D. P. Kothari, Theory of AC Machines, Tata McGraw Hill, 2006.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	2	2	-	-	-	2	2	-	-	-	-
CO2	1	1	-	1	1	-	-	-	2	2	-	-	-	-
CO3	2	1	-	2	2	-	-	-	2	2	-	-	-	-
CO4	2	1	-	2	2	-	-	-	2	2	-	-	-	-
CO5	2	1	-	2	2	-	-	-	2	2	-	-	-	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO No	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	2,4	50	
			Total	100

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HOD-Electrical and Electronics Engineering
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Pollachi - 642 003.

Course Code: 19EESN4401	Course Title: Process Engineering in Mechanical Part Assembly		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 1: 0: 3	Credits:2.5	Total Contact Hours:60	Max Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain the processes and procedures to perform casting and injection moulding
2. Describe the processes and procedures to perform machining
3. Illustrate the processes and procedures to perform sheet metal and metal joining
4. Manufacture the given parts by applying suitable standards and procedures as per the control plan for the required specification
5. Inspect the manufactured parts to perform corrective and preventive actionon the part using suitable testing methods

Unit I Casting and Injection Moulding **3 Hours**

Packaging processes for electrical / electronic products. Passivation in metals (anodizing,galvanizing, chrome plating, Nickel Plating, Powder coating). Plastic moulding process – types, injection moulding process, compression moulding process Packaging processes for electrical / electronic products. Passivation in Plastics (PVD coating , hot dip coating , spraying)

Experiment-1. Preparation of mould using two moulding boxes using patterns or without patterns. (Split pattern, Match plate pattern and Core boxes).

Experiment - 2. Preparation of Mould Cavity for Gear Pattern.

Unit II Machining Operations **3 Hours**

Process for making inserts (Heat staking, Ultrasonic assisted, insert Moulding, Cold Pressed)

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Types of Snap Fits (Cantilever, U- Shaped,Torsion,Annular).

Experiment-3. Facing and Turning using lathe for water level controller.

Experiment-4. Drilling using drilling machine for water level controller.

Experiment-5. Making screw using Capstan / Turret lathe.

Unit III Sheet Metal and Metal Joining Processes **3Hours**

Sheet metal characteristics, shearing processes (piercing, perforation,blanking,trimming,notching,nibbling and shaving processes). CNC bending (CPU panel, MCB panel). Drawing, re-drawing, embossing, coining and stamping. Packaging processes for electrical / electronic product. Resistance welding and its types(spot,seam,projection,flash butt).welding symbol. Additive manufacturing – 3D printing.

Experiment-6. Drilling, tapping and bending operations in sheet metal.

Experiment-7. Transformer Casing for water level controller.

Experiment-8. Welding of Lap joint.

Experiment-9. Welding of T-joint.

Unit IV Standards, Dimensions and Control plan in Part Manufacturing **3 Hours**

Production drawing, geometric dimensions and standards- straightness, flatness, circularity, perpendicularity, surface finish. Control plan –sequence of operation (work flow instruction), tools required, machining parameters, special requirements (finishing)

Experiment- 10 Inspection of dimensions using metrology tools

Unit V Corrective and Preventive Action using Suitable Testing Methods **3 Hours**

Root cause analysis – material, dimensions, Geometry, Physical distortions – methods (fish-bone diagram). Reworking methods(Machining incase of stock availability , drilling , adhesive bonding , repainting / recoating / replating)

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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Identify the processes and procedures to perform casting and injection moulding	Apply
CO2: Build the processes and procedures to perform machining	Apply
CO3: Build the processes and procedures to perform sheet metal and metal joining	Apply
CO4: Build the given parts by applying suitable standards and procedures as per the control plan for the required specification	Apply
CO5: Interpret the manufactured parts to perform corrective and preventive action on the part using suitable testing methods	Understand

Text Book(s):

T1. Serope Kalpakjian and Steven R. Schmid, "Manufacturing Process for Engineering Materials", 5th Edition, Pearson Education, 2014.

T2. Worksheets and Handouts prepared by MCET team.

Reference Book(s):

R1. P. N. Rao, "Manufacturing Technology: Foundry, Forming and Welding", 4th (Vol.1) Kindle Edition, 2013

R2. Sharma, P.C., A Text book of Production Technology, S. Chand and Co. Ltd.2014.

R3. Roy. A. Lindberg, Processes and Materials of Manufacture, PHI / Pearson Education, 2006.

Web References:

1. https://www.BOConline.co.uk

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2. http://www.nimionlinelearning.gov.com

3.http://www.engineeringarticles.org/manufacturing-process-meaning-and-types/

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	2	2	-	-	-	-
CO2	2	-	-	-	-	-	-	-	2	2	-	-	-	-
CO3	2	-	-	-	-	-	-	-	2	2	-	-	-	-
CO4	2	-	-	-	-	-	-	-	2	2	-	-	-	-
CO5	1	-	-	-	-	-	-	-	2	2	-	-	-	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO No	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4	50	
Total				100

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