ADHIYAMAAN COLLEGE OF ENGINEERING

[An Autonomous Institution Affiliated to Anna University, Chennai]
[Accredited by NAAC]
Dr.M.G.R NAGAR, HOSUR, KRISHNAGIRI (DT) – 635 130, TAMILNADU, INDIA
REGULATION 2018
CHOICE BASED CREDIT SYSTEM

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

The department of electrical and electronics engineering is focused to produce highly competent electrical engineers by imparting effective teaching learning process to meet the rapidly changing technical scenario.

MISSION

- To produce world class electrical engineers with advanced professional knowledge, critical problem solving and analytical skills through effective teaching, research and industrial collaboration.

- To equip students with skills in the areas of interpersonal communication, ethics, team work and project management.

The Programme defines Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes as follows:

I. PROGRAMME EDUCATIONAL OBJECTIVES [PEOs]

PEO 1 Our graduates will excel in industry and in higher studies by learning the Engineering Sciences with more emphasis in Electrical and Electronics Engineering along with high moral values.

PEO 2 Our graduates will have good scientific and engineering expertise so as to comprehend, to analyze, to design and to create innovative products and solutions for the challenges of multi-disciplinary fields.

PEO 3 Our graduates will exhibit professional and ethical attitude, effective communication skills, teamwork skills, leadership skills, life-long learning, entrepreneurial thinking, global competency and an ability to transform engineering solutions into broader social context.

II. PROGRAMME OUTCOMES [POs]

PO1 An ability to exhibit the knowledge of science, mathematics, communication and programming skills.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

PO2 An ability to identify, formulate and analytically solve electrical engineering problems.

PO3 Demonstrate their ability in designing analog and digital systems and develop products and solutions.

PO4 An ability to investigate the complex problems in research and industry.

PO5 Build the capability to use all current and future modern tools to analyze problems in global contexts.

PO6 An ability to exhibit the knowledge to assess societal, health, safety, legal and cultural issues and the relevant responsibilities to the professional engineering practice.

PO7 An ability to design electrical systems those are efficient, within realistic context such as economic, environmental, social, political, manufacturability and sustainability.

PO8 Ability to impart holistic professional and ethical values.

PO9 To function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

PO10 An ability to listen and communicate effectively in verbal and written form.

PO11 Ability to exhibit quality managerial skills in finance, economics and project management.

PO12 Competent enough for self study and for life-long learning in the broadest context of rapid technological changes.

III. PROGRAM SPECIFIC OUTCOMES [PSOs]

PSO1 **Skilled Professional in Electrical & Electronics Engineering:**

Ability to identify, formulate and solve real time problems by applying the knowledge acquired during the course of the program.

PSO2 **Problem Solving Skills:**

Ability to understand the recent technological developments in Electrical & Electronics Engineering and to develop products/Software to cater the societal & Industrial needs.

PSO3 **Successful Career:**

Ability to utilize the modern technologies in building innovative career paths for being a thriving entrepreneur and to have a zest for higher studies.

-

Correlation of PEOs with POs and PSOs

Program Educational Objectives (PEOs)	Program Outcomes(POs)												Program Specific Outcomes (PSOs)		
	a	b	c	d	e	f	g	h	i	j	k	l	1	2	3
PEO I	√	√	√	√	√		√				√	√	√	√	√
PEO II	√	√	√	√	√	√	√		√	√		√	√		√
PEO III						√	√	√	√	√	√	√			√

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

PROGRAM ARTICULATION MATRIX

B.E-ELECTRICAL AND ELECTRONICS ENGINEERING

YEAR	SEMESTER	COURSE NAME	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	**1**	Technical English	3	2			2			1				2	2	2	1
1	**1**	Engineering Mathematics – I	3	3	2									2	2	2	
1	**1**	Engineering Physics	3	2			3		2					2	2	2	1
1	**1**	Engineering Chemistry	3	2		3											

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

1	**1**	Problem Solving And Python Programming	3	3	2		2					2		2		2	1
1	**1**	Elective GROUP I															
1	**1**	Engineering Physics Laboratory	3	2		3											
1	**1**	Problem Solving And Python Programming Laboratory	3	3	2		2					2		2		2	
1	**2**	Communicative English	3	3	2	3	2					2		2		2	1
1	**2**	Engineering Mathematics-II	3	3	2									2	2	2	
1	**2**	Environmental Science and Engineering	2				1	2	3						2		1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

1	**2**	Engineering Graphics	3	3									2		2	2	1
1	**2**	Circuit Theory	3		1		2	1						1	2	1	
1	**2**	Indian Constitution															
1	**2**	Elective (GROUP 2)															
1	**2**	Engineering Chemistry Laboratory	3	2		3											
1	**2**	Engineering Practice Laboratory	3	2	2	2					2	2		2	2	3	1
1	**2**	Electron Devices and Circuits Laboratory	3	2			1								3	2	1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

2	**3**	Engineering Mathematics-III	3	2	2									2	2	2	
2	**3**	Electromagnetic Theory	3	2			1								3	1	1
2	**3**	Network Analysis and Synthesis	3	2	1		2				2				2	2	1
2	**3**	Linear Integrated Circuits and Applications	2	2	2		2				2				2	2	1
2	**3**	Measurements and Instrumentation	3		1		2	1						1	2	1	1
2	**3**	Fundamentals of Data Structures in C	2	3	3		3								3	2	2
2	**3**	Linear Integrated Circuits Laboratory	3	2	2						2			2	2	1	1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

2	**3**	Measurements and Instrumentation Laboratory			2		2	2			2	3	1		2	1	2
2	**3**	Fundamentals of Data Structures in C Laboratory	3	2	1				2		2			3	2	1	2
2	**4**	Numerical Methods	3	2	2	2	1							2	2	2	
2	**4**	Control Systems	3	2	1		2				3			2	2	2	1
2	**4**	Digital Electronic Circuits	2	3	2		2				3				3	1	2
2	**4**	Power Generation Systems	3	2	3	3	2				3		2	2	2	3	2
2	**4**	Electrical Machines-I	2	2			2	2							1		

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

2	**4**	Professional Elective - III															
2	**4**	Electrical Machines-I Laboratory	3	2	2	2	3				1				2	2	1
2	**4**	Electrical and Electronic Circuits Simulation Laboratory	1	2	2		2				1				1	2	1
2	**4**	Control Systems Laboratory	3	2	1							1					
3	**5**	Microprocessors and Microcontrollers	3	2	3	3	3				2		2	2	2	2	2
3	**5**	Electrical Machines – II	2	3	3	2		3	2		2				2	2	2
3	**5**	Advanced Control Theory	3	2		1									2	1	1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

3	**5**	Protection and Switchgear	2	2			2	2							1		
3	**5**	Transmission and Distribution	2	2			1								1		
3	**5**	Open Elective I															
3	**5**	Electrical Machines Laboratory- II	3	2	2	2	2								2	2	1
3	**5**	Microprocessors and Microcontrollers Laboratory	3	2	3	3	3				2		2	2	2	3	2
3	**5**	Digital Electronics Laboratory	2	2				1							2	1	1
3	**6**	Electrical Machine Design	2	3	3		3								2	3	1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

3	**6**	Power Electronics	3	2	1		2								2	3	1
3	**6**	Power System Analysis and Stability	3	2	2	2	3				1				2	2	2
3	**6**	High Voltage Engineering	3	2		1									2	2	1
3	**6**	Renewable Energy Sources	2	1											2	2	1
3	**6**	Professional Elective IV															
3	**6**	Power Electronics Laboratory	3	3		3	2				2	1			3	2	1
3	**6**	Electronic System Design Laboratory	2	3	3	2	1							2	2	3	2

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

3	**6**	Employability Skills Laboratory	3	2			1								2		2
4	**7**	Power System Operation and Control	3	3		3	2				2	1			3	2	1
4	**7**	Electric Drives and Control	2	3	3	2	1							2	2	3	2
4	**7**	Special Electrical Machines	3	2			1								2		2
4	**7**	Power Quality Management	3	3		3	2				2	1			3	2	1
4	**7**	Professional Elective V															
4	**7**	Professional Elective VI															

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

4	**7**	Power System Simulation Laboratory	3	2	1		2								2	2	2
4	**7**	Electric Drives Laboratory	3	2	3	3	3				2		2	2	2	3	2
4	**7**	Mini Project Work						3	2	2		2		2	3	2	2
4	**8**	Electric Power Utilization Energy Auditing	2	2			1								1		2
4	**8**	Professional Elective-VII															
4	**8**	Professional Elective-VIII															
4	**8**	Project Work						3	2	2		2		2	3	2	2

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Semester I

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	118ENT01	Technical English	HS	2	0	0	2	2
2.	118MAT02	Engineering Mathematics-I	BS	3	0	0	3	3
3.	118PHT03	Engineering Physics	BS	2	0	0	2	2
4.	118CYT04	Engineering Chemistry	BS	3	0	0	3	3
5.	118PPT05	Problem Solving And Python Programming	ES	3	0	0	3	3
6.	118ESE0X	ELECTIVE (GROUP1)	ES	3	0	0	3	3
PRACTICALS								
7.	118PHP07	Engineering Physics Laboratory	BS	0	0	2	**2**	1
8.	118PPP08	Problem Solving and Python Programming Laboratory	ES	0	0	2	**2**	1
			TOTAL	**16**	**0**	**4**	**20**	**18**

ELECTIVE (GROUP 1)

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	118ESE01	Basic Civil and Mechanical Engineering	ES	3	0	0	3	3
2.	118ESE05	Basic Mechanical Electrical and Instrumentation Engineering	ES	3	0	0	3	3
3.	118ESE06	Basic Electrical Electronics and Instrumentation Engineering	ES	3	0	0	3	3
4.	118ESE07	Biology For Engineers	ES	3	0	0	3	3

Semester II

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	218ENT01	Communicative English	HS	2	0	2	4	3
2.	218MAT02	Engineering Mathematics-II	BS	3	1	0	4	4
3.	218GET03	Environmental Science and Engineering	BS	2	0	0	2	2
4.	218EGT04	Engineering Graphics	ES	2	0	4	6	4
5.	215CAT05	Circuit Theory	PC	3	0	0	3	3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

6.	X18MCT01	Indian Constitution	MC	1	0	0	1	0
7.	**218BSE0X**	**ELECTIVE (GROUP 2)**	**BS**	**2**	**0**	**0**	**2**	**2**
PRACTICALS								
8.	218CYP07	Engineering Chemistry Laboratory	BS	0	0	2	**2**	1
9.	218EPP08	Engineering Practice Laboratory	ES	0	0	2	**2**	1
10.	218EDP09	Electron Devices and Circuits Laboratory	ES	0	0	2	**2**	1
			TOTAL	**15**	**1**	**12**	**28**	**21**

ELECTIVE (GROUP 2)

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	218BSE03	Chemistry for Technologists	BS	2	0	0	2	2
2.	218BSE04	Energy Storage Devices and Fuel Cells	BS	2	0	0	2	2
3.	218BSE07	Physics Of Semiconductor	BS	2	0	0	2	2
4.	218BSE08	Physics for Electronics Engineering	BS	2	0	0	2	2

Semester III

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	318MAT01	Engineering Mathematics-III	BS	3	1	0	4	4
2.	318EET02	Electromagnetic Theory	PC	3	0	0	3	3
3.	318EET03	Network Analysis and Synthesis	PC	3	0	0	3	3
4.	318EET04	Linear Integrated Circuits and Applications	PC	3	0	0	3	3
5.	318EET05	Measurements and Instrumentation	PC	3	0	0	3	3
6.	318EET06	Fundamentals of Data Structures in C	PC	3	0	0	3	3
PRACTICALS								
7.	318EEP07	Linear Integrated Circuits Laboratory	PC	0	0	2	**2**	1
8.	318EEP08	Measurements and Instrumentation Laboratory	PC	0	0	2	**2**	1
9.	318EEP09	Fundamentals of Data Structures in C Laboratory	PC	0	0	2	**2**	1
			TOTAL	**18**	**1**	**6**	**25**	**22**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Semester IV

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	418EET01	Numerical Methods	BS	3	1	0	4	4
2.	418EET02	Control Systems	PC	3	0	0	3	3
3.	418EET03	Digital Electronic Circuits	PC	3	0	0	3	3
4.	418EET04	Power Generation Systems	PC	3	0	0	3	3
5.	418EET05	Electrical Machines – I	PC	3	0	0	3	3
6.	418EEEXX	Professional Elective-III	PE	3	0	0	3	3
PRACTICALS								
7.	418EEP07	Electrical Machines-I Laboratory	PC	0	0	2	**2**	1
8.	418EEP08	Electrical and Electronic Circuits Simulation Laboratory	PC	0	0	2	**2**	1
9.	418EEP09	Control Systems Laboratory	PC	0	0	2	**2**	1
			TOTAL	**18**	**1**	**6**	**25**	**22**

PROFESSIONAL ELECTIVE -III

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	418EEE06	Bio-Medical Instrumentation	PE	3	0	0	3	3
2.	418EEE07	Neural Networks and Fuzzy Systems	PE	3	0	0	3	3
3.	418EEE08	Electrical Engineering Materials	PE	3	0	0	3	3
4.	418EEE09	Fundamentals of Nano Science	PE	3	0	0	3	3

Semester V

S.NO	COURSE CODE	THEORY	Category	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	518EET01	Microprocessors and Microcontrollers	PC	3	0	0	3	3
2	518EET02	Electrical Machines – II	PC	3	0	0	3	3
3	518EET03	Advanced Control Theory	PC	3	1	0	4	4
4	518EET04	Protection and Switchgear	PC	3	0	0	3	3
5	518EET05	Transmission and Distribution	PC	3	0	0	3	3
6		**Open Elective-I**	**OE**	**3**	**0**	**0**	**3**	**3**
PRACTICALS								
7	518EEP07	Electrical Machines Laboratory – II	PC	0	0	2	2	1
8	518EEP08	Microprocessors and Microcontrollers	PC	0	0	2	2	1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

		Laboratory						
9	518EEP09	Digital Electronics Laboratory	PC	0	0	2	2	1
			TOTAL	**18**	**1**	**6**	**25**	**22**

OPEN ELECTIVE-I

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	518ECO06/ 518ECT03	Communication Theory	OE	3	0	0	3	3
2.	518MEO07/ 715MET01	Mechatronics and Robotics	OE	3	0	0	3	3
3.	518ITO08/ 318CIT06	Computer Organization	OE	3	0	0	3	3
4.	518ECO09/ 518ECT01	Digital Signal Processing	OE	3	0	0	3	3

Semester VI

No	Course Code	Course Title	Category	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	618EET01	Electrical Machine Design	PC	3	0	0	3	3
2	618EET02	Power Electronics	PC	3	0	0	3	3
3	618EET03	Power System Analysis and Stability	PC	3	1	0	4	4
4	618EET04	High Voltage Engineering	PC	3	0	0	3	3
5	618EET05	Renewable Energy Sources	PC	3	0	0	3	3
6		**PROFESSIONAL ELECTIVE-IV**	**PE**	**3**	**0**	**0**	**3**	**3**
		PRACTICALS						
7	618EEP07	Power Electronics Laboratory	PC	0	0	2	2	1
8	618EEP08	Electronic System Design Laboratory	PC	0	0	2	2	1
9	618EEP09	Employability Skills Laboratory	EEC	0	0	2	2	1
			TOTAL	**18**	**1**	**6**	**25**	**22**

PROFESSIONAL ELECTIVE IV

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	618EEE01	Distributed Generation and Micro Grid	PE	3	0	0	3	3
2.	618EEE02	VLSI Design	PE	3	0	0	3	3
3.	618EEE03	High Voltage Direct	PE	3	0	0	3	3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

		Current Transmission						
4.	618EEE04	Artificial Intelligence and Data Science	PE	3	0	0	3	3

Semester VII

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	718EET01	Power System Operation and Control	PC	3	0	0	3	3
2.	718EET02	Electric Drives and Control	PC	3	1	0	4	4
3.	718EET03	Special Electrical Machines	PC	3	0	0	3	3
4.	718EET04	Power Quality Management	PC	3	0	0	3	3
5.		PROFESSIONAL ELECTIVE-V	PE	3	0	0	**3**	**3**
6.		PROFESSIONAL ELECTIVE-VI	PE	3	0	0	3	3
PRACTICALS								
7.	718EEP07	Power System Simulation Laboratory	PC	0	0	2	**2**	1
8.	718EEP08	Electric Drives Laboratory	PC	0	0	2	**2**	1
9.	718EEP09	Mini Project Work	EEC	0	0	2	**2**	1
			TOTAL	**18**	**1**	**6**	**25**	**22**

PROFESSIONAL ELECTIVE V

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	718EEE05	Flexible AC Transmission Systems	PE	3	0	0	3	3
2.	718EEE06	Embedded Systems	PE	3	0	0	3	3
3.	718EEE07	Smart Grid	PE	3	0	0	3	3
4.	718EEE08	Modern Power Converters	PE	3	0	0	3	3

PROFESSIONAL ELECTIVE VI

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	718EEE09	EHV Power Transmission	PE	3	0	0	3	3
2.	718EEE10	Power Electronics for Renewable Energy Systems	PE	3	0	0	3	3
3.	718EEE11	Aircraft Electrical Systems	PE	3	0	0	3	3
4.	718EEE12	Adaptive Control	PE	3	0	0	3	3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Semester VIII

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	818EET01	Electric Power Utilization Energy Auditing	PC	3	0	0	3	3
2.		PROFESSIONAL ELECTIVE-VII	PE	3	0	0	**3**	**3**
3.		PROFESSIONAL ELECTIVE-VIII	PE	3	0	0	3	3
PRACTICALS								
4.	818EEP04	Project Work	EEC	0	0	12	**12**	6
			TOTAL	**9**	**0**	**12**	**21**	**15**

PROFESSIONAL ELECTIVE VII

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	818EEE02	Disaster Management	PE	3	0	0	3	3
2.	818EEE03	Electric Vehicle Technology	PE	3	0	0	3	3
3.	818EEE04	Total Quality Management	PE	3	0	0	3	3
4.	818EEE05	Industrial Automation	PE	3	0	0	3	3

PROFESSIONAL ELECTIVE VIII

S. NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	818EEE06	Power System Dynamics	PE	3	0	0	3	3
2.	818EEE07	Professional Ethics and Human Values	PE	3	0	0	3	3
3.	818EEE08	Insulation and Testing Engineering	PE	3	0	0	3	3
4.	818EEE09	Wireless Power Transfer Technologies	PE	3	0	0	3	3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Regulations-2018

CBCS – UG CURRICULUM

NAME OF THE UG PROGRAMME: ELECTRICAL AND ELECTRONICS ENGINEERING

Humanities and Social Science (HS)							
SL.No.	Course Code	Course Title	Periods / Week & Credits				Preferred Semester
			L	T	P	C	
1	118ENT01	Technical English	2	0	0	2	1
2	218ENT01	Communicative English	2	0	2	3	2

Basic Science (BS)							
SL.No.	Course Code	Course Title	Periods / Week & Credits				Preferred Semester
			L	T	P	C	
1	118MAT02	Engineering Mathematics-I	3	0	0	3	1
2	118PHT03	Engineering Physics	2	0	0	2	1
3	118CYT04	Engineering Chemistry	3	0	0	3	1
4	118PHP07	Engineering Physics Laboratory	0	0	2	1	1
5	218MAT02	Engineering Mathematics-II	3	1	0	4	2
6	218GET03	Environmental Science and Engineering	2	0	0	2	2
7	218CYP07	Engineering Chemistry Laboratory	0	0	2	1	2
8	218BSE03	Chemistry for Technologists	2	0	0	2	2
9	218BSE04	Energy Storage Devices and Fuel Cells	2	0	0	2	2
10	218BSE07	Physics Of Semiconductor	2	0	0	2	2
11	218BSE08	Physics for Electronics Engineering	2	0	0	2	2
12	318EET01	Engineering Mathematics-III	3	1	0	4	3
13	418EET01	Numerical Methods	3	1	0	4	4

Engineering Science (ES)							
SL.No.	Course Code	Course Title	Periods / Week & Credits				Preferred Semester
			L	T	P	C	
1	118PPT05	Problem Solving And Python Programming	3	0	0	3	1
2	118PPP08	Problem Solving and Python Programming Laboratory	0	0	2	1	1
3	118ESE01	Basic Civil and Mechanical Engineering	3	0	0	3	1
4	118ESE05	Basic Mechanical Electrical and Instrumentation Engineering	3	0	0	3	1
5	118ESE06	Basic Electrical Electronics and Instrumentation Engineering	3	0	0	3	1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

6	118ESE07	Biology For Engineers	3	0	0	3	1
7	218EGT04	Engineering Graphics	2	0	4	4	2
8	218EPP08	Engineering Practice Laboratory	0	0	2	1	2
9	218EDP09	Electron Devices and Circuits Laboratory	0	0	2	1	2

Professional Core (PC)							
SL.No.	**Course Code**	**Course Title**	**Periods / Week & Credits**				**Preferred Semester**
			L	**T**	**P**	**C**	
1.	218CAT05	Circuit Theory	3	0	0	3	2
2.	318EET02	Electromagnetic Theory	3	0	0	3	3
3.	318EET03	Network Analysis and Synthesis	3	0	0	3	3
4.	318EET04	Linear Integrated Circuits and Applications	3	0	0	3	3
5.	318EET05	Measurements and Instrumentation	3	0	0	3	3
6.	318EET06	Fundamentals of Data Structures in C	3	0	0	3	3
7.	318EEP07	Linear Integrated Circuits Laboratory	0	0	2	1	3
8.	318EEP08	Measurements and Instrumentation Laboratory	0	0	2	1	3
9.	318EEP09	Fundamentals of Data Structures in C Laboratory	0	0	2	1	3
10.	418EET02	Control Systems	3	0	0	3	4
11.	418EET03	Digital Electronic Circuits	3	0	0	3	4
12.	418EET04	Power Generation Systems	3	0	0	3	4
13.	418EET05	Electrical Machines – I	3	0	0	3	4
14.	418EEP07	Electrical Machines-I Laboratory	0	0	2	1	4
15.	418EEP08	Electrical and Electronic Circuits Simulation Laboratory	0	0	2	1	4
16.	418EEP09	Control system Laboratory	0	0	2	1	4
17.	518EET01	Microprocessors and Microcontrollers	3	0	0	3	5
18.	518EET02	Electrical Machines – II	3	0	0	3	5
19.	518EET03	Advanced Control Theory	3	1	0	4	5
20.	518EET04	Protection and Switchgear	3	0	0	3	5
21.	518EET05	Transmission and Distribution	3	0	0	3	5
22.	518EEP07	Electrical Machines-II Laboratory	0	0	2	1	5
23.	518EEP08	Microprocessor and Micro controllers Laboratory	0	0	2	1	5
24.	518EEP09	Digital Electronic Laboratory	0	0	2	1	5
25.	618EET01	Electrical Machine Design	3	0	0	3	6
26.	618EET02	Power Electronics	3	0	0	3	6
27.	618EET03	Power System Analysis and Stability	3	1	0	4	6
28.	618EET04	High Voltage Engineering	3	0	0	3	6
29.	618EET05	Renewable Energy Sources	3	0	0	3	6
30.	618EEP07	Power Electronics Laboratory	0	0	2	1	6
31.	618EEP08	Electronic System Design Laboratory	0	0	2	1	6
32.	718EET01	Power System Operation and Control	3	0	0	3	7
33.	718EET02	Electric Drives and Control	3	1	0	4	7

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

34.	718EET03	Special Electrical Machines	3	0	0	3	7
35.	718EET04	Power Quality Management	3	0	0	3	7
36.	718EEP07	Power System Simulation Laboratory	0	0	2	1	7
37.	718EEP08	Electric Drives laboratory	0	0	2	1	7
38.	818EET01	Electric Power Utilization and Energy Auditing	3	0	0	3	8

Professional Elective (PE)							
SL.No.	**Course Code**	**Course Title**	**Periods / Week & Credits**				**Preferred Semester**
			L	**T**	**P**	**C**	
1.	418EEE06	Bio-Medical Instrumentation	3	0	0	3	4
2.	418EEE07	Neural Networks and Fuzzy Systems	3	0	0	3	4
3.	418EEE08	Electrical Engineering Materials	3	0	0	3	4
4.	418EEE09	Fundamentals of Nano Science	3	0	0	3	4
5.	618EEE01	Distributed Generation and Micro Grid	3	0	0	3	6
6.	618EEE02	VLSI Design	3	0	0	3	6
7.	618EEE03	High Voltage Direct Current Transmission	3	0	0	3	6
8.	618EEE04	Artificial Intelligence and Data Systems	3	0	0	3	6
9.	718EEE05	Flexible AC Transmission Systems	3	0	0	3	7
10.	718EEE06	Embedded Systems	3	0	0	3	7
11.	718EEE07	Smart Grid	3	0	0	3	7
12.	718EEE08	Modern Power Converters	3	0	0	3	7
13.	718EEE09	EHV Power Transmissions	3	0	0	3	7
14.	718EEE10	Power Electronics for Renewable Energy Systems	3	0	0	3	7
15.	718EEE11	Aircraft Electronic Systems	3	0	0	3	7
16.	718EEE12	Adaptive Control	3	0	0	3	7
17.	818EEE02	Disaster Management	3	0	0	3	8
18.	818EEE03	Electric Vehicle Technology'	3	0	0	3	8
19.	818EEE04	Total Quality Management	3	0	0	3	8
20.	818EEE05	Industrial Automation	3	0	0	3	8
21.	818EEE06	Power System Dynamics	3	0	0	3	8
22.	818EEE07	Professional Ethics and Human Values	3	0	0	3	8
23.	818EEE08	Insulation and Testing Engineering	3	0	0	3	8
24.	818EEE09	Wireless Power Transfer Technologies	3	0	0	3	8

Open Elective (OE)							
SL.No.	**Course Code**	**Course Title**	**Periods / Week & Credits**				**Preferred Semester**
			L	**T**	**P**	**C**	
1	518ECO06/ 518ECT03	Communication Theory	3	0	0	3	5
2	518MEO07/ 715MET01	Mechatronics and Robotics	3	0	0	3	5
3	518ITO08/3 18CIT06	Computer Organization	3	0	0	3	5
4	518ECO09/ 518ECT01	Digital Signal Processing	3	0	0	3	5

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Employability Enhancement Courses (EEC)							
SL.No.	Course Code	Course Title	Periods / Week & Credits				Preferred Semester
			L	T	P	C	
1	618EEP09	Employability Skills Laboratory	0	0	2	1	6
2	718EEP09	Mini Project Work	0	0	2	1	7
3	818EEP04	Project Work	0	0	12	6	8

Noncredit / Mandatory Courses (MC)							
SL.No.	Course Code	Course Title	Periods / Week & Credits				Preferred Semester
			L	T	P	C	
1.	X18MCT01	Indian Constitution	1	0	0	0	2

SUMMARY

SL.No.	Subject Area	Credits per semester								Credits Total
		I	II	III	IV	V	VI	VII	VIII	
1	HS	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**5**
2	BS	**9**	**9**	**4**	**4**	**-**	**-**	**-**	**-**	**26**
3	ES	**7**	**6**	**-**	**-**	**-**	**-**	**-**	**-**	**13**
4	PC	**-**	**3**	**18**	**15**	**19**	**18**	**15**	**3**	**91**
5	PE	**-**	**-**	**-**	**3**	**-**	**3**	**6**	**6**	**18**
6	OE	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**3**
7	EEC	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**6**	**8**
8	MC	**-**	**0**	**-**	**-**	**-**	**-**	**-**	**-**	**0**
	Total	**18**	**21**	**22**	**22**	**22**	**22**	**22**	**15**	**164**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Semester I

		L	T	P	C
118ENT01	**TECHNICAL ENGLISH**	**2**	**0**	**0**	**2**

COURSE OBJECTIVES

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization

UNIT I **9**

Listening - Ink talks and gap exercises - **Speaking** – Asking for and giving directions - **Reading** – short technical texts from journals and newspapers - **Writing** - definitions – instructions – checklists – recommendations - **Vocabulary Development** - technical vocabulary -**Language Development** – parts of speech – articles – word formation.

UNIT II **9**

Listening - longer technical talks - **Speaking** – process description - **Reading** – longer technical texts – **Writing** – graphical representation - **Vocabulary Development** - vocabulary used in formal letters/emails and reports - **LanguageDevelopment** – tenses - voices - numerical adjectives – question tags.

UNIT III **9**

Listening - listening to classroom lectures - **Speaking** – introduction to technical presentations - **Reading** – longer texts both general and technical and practice in speed reading – **Writing** – process description using sequence words and sentences - **Vocabulary Development** - Misspelled words – one-word substitution - **Language Development** - embeddedsentences – singular and plural nouns - compound nouns – editing.

UNIT IV **9**

Listening - Listening to documentaries and making notes - **Speaking** – mechanics of presentations - **Reading** – reading comprehension – **Writing** - email etiquettes - job application – cover letter – Résumé preparation - essay writing - **Vocabulary Development** – synonyms and antonyms – paraphrasing - **Language Development** – modals – conditionals.

UNIT V **9**

Listening - TED talks - **Speaking** – brainstorming and debate – **Reading** – reading and understanding technical articles– **Writing** – reports - minutes of a meeting - **Vocabulary Development**- verbal analogies - phrasal verbs - **Language Development** - concord - reported speech.

TOTAL:45 PERIODS

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

COURSE OUTCOMES

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

CO1 Read technical texts and write area- specific texts effortlessly.

CO2 Listen and comprehend lectures and talks in their area of specialization successfully.

CO3 Speak appropriately and effectively in varied formal and informal contexts.

CO4 Understand the basic grammatical structures and its applications.

CO5 Write reports and winning job applications.

TEXT BOOKS

1. Board of editors. Fluency in English A Course book for Engineering and Technology. Orient Blackswan,Hyderabad: 2016.
2. Sudharshana. N.P and Saveetha. C. English for Technical Communication, Cambridge University Press: New Delhi, 2016.
3. Uttham Kumar. N. Technical English I (with work book). Sahana Publications, Coimbatore, 2016.

REFERENCE BOOKS

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi,2014.
2. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015.
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.

   Students can be asked to read Tagore and Chetan Bhagat for supplementary reading.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2										2	2		
CO2	3	2			2			1				2	2		1
CO3	3	2			2							2	2	2	1
CO4	3	2			2							2		2	1
CO5	3	2						1				2		2	

118MAT02 **ENGINEERING MATHEMATICS-I**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To understand the eigen value problems.
- To solve differential equations of certain types, including systems of differential

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

equations that they mightencounter in the same or higher semesters.

- To understand the concepts of curvatures, evolutes and envelopes and to study the maxima and minima ofany function.
- To learn the partial derivatives and apply the same to find maxima and minima.
- To solve certain linear differential equations using the Laplace transform technique which has applicationsin control theory and circuit theory.

UNIT I MATRICES 9

Eigenvalues and eigenvectors of a real symmetric matrix –Properties – Cayley - Hamilton theorem (Statement only) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form –Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II DIFFERENTIAL CALCULUS DIFFERENTIAL CALCULUS 9

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolutes as envelope of normals.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Jacobians – Taylor's expansion– Maxima and Minima – Method of Lagrangian multipliers.

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS 9

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients-Applications to Engineering problems-Electric Circuits, Simple Harmonic Motions and bending of beams.

UNIT V LAPLACE TRANSFORM 9

Laplace transforms – Conditions for existence –Basic properties (without proof) – Laplace Transform of elementary functions, derivatives and integrals, unit step function and impulse functions, periodic functions. Definition of Inverse Laplace transform – Convolution theorem (Statement and applications only) – Initial and final value theorems (Statement and applications only) – Solution of linear ordinary differential equations of second order with constant coefficients usingLaplace transform techniques.

TOTAL:45 PERIODS

COURSE OUTCOMES

After completing this course, the student will be able to:

CO1 Develop the knowledge of basic linear algebraic concepts.

CO2 Determine the solutions of ordinary differential equations by various methods which have an application in theircore subjects.

CO3 Acquire the basic knowledge of ordinary differential calculus.

CO4 Compute maxima and minima of a function.

CO5 Apply Laplace transform techniques to solve ordinary differential equations which have an application in manyengineering fields.

TEXT BOOKS

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 10th edition New Delhi 2016.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

2. Grewal. B.S, "Higher Engineering Mathematics", 44th Edition, Khanna Publications, Delhi, 2017.

REFERENCE BOOKS

1. T.Veerarajan, "Engineering Mathematics" ,Tata McGraw-Hill Publishing company, New Delhi, 2014.
2. Kandasamy.P, Thilagavathy,K., &Gunavathi.K., "Engineering Mathematics for first year ", S.Chand & Company Ltd., New Delhi,2014.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
5. V.Prameelakaladharan and G.Balaji, "Engineering Mathematics - I", 3rd Edition, Amrutha marketing, Chennai, 2017.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1	3	2	2									2	2	2	
CO2	3	3	2									2	2	2	
CO3	3	3	3									2	2	2	
CO4	3	3	3									2	2	2	
CO5	3	2	1									2	2	2	

118PHT03 ENGINEERING PHYSICS

L	T	P	C
2	0	0	2

COURSE OBJECTIVES

- To understand the concept of properties of matter.
- To understand the properties of sound and principles of quantization of energy.
- To understand the properties of coherent light and its importance.

UNIT I PROPERTIES OF MATTER **9**

Elasticity – Stress – Strain diagram – Factors affecting elasticity – Twisting couple on a wire – Torsion pendulum – Young's modulus - cantilever – Uniform and Non uniform bending (theory and experiment)–Viscosity-Poiseuille's method for Coefficient of Viscosity (Qualitative).

UNIT II ACOUSTICS AND ULTRASONICS **9**

Classification of sound, loudness, intensity – Decibel – Weber Fechner Law – Reverberation and Reverberation time – derivation of Sabine's formula for Reverberation time (Growth and Decay)–

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Absorption coefficient and its determination.

Introduction of Ultrasonics – Production – magnetostriction effect – magnetostriction generator – piezoelectric effect – piezoelectric generator – Detection of ultrasonic waves, properties – Cavitation– Applications – Depth of sea – Non Destructive Testing.

UNIT III QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh–jeans' Law from Planck's theory – Compton Effect–derivation– Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box – Degeneracy and Non-degeneracy.

UNIT IV LASER 9

Introduction – Principle of Spontaneous emission and stimulated emission – Population inversion – pumping – Einstein's A and B coefficients – derivation – Types of lasers – He-Ne, CO_2, Nd-YAG, Semiconductor lasers – homojunction – Applications of Laser.

UNIT V WAVE OPTICS & FIBRE OPTICS 9

Interference – Air wedge (theory & experiment) – Polarization– Methods of polarizing light- Theoryof plane circularly and elliptically polarized light.

Principle and propagation of light in optical fibers – Numerical aperture and Acceptance angle – Types of optical fibers (material, refractive index, and mode) – Fiber optical communication system(Block diagram) – Fiber optic sensors – Temperature & Displacement sensors (Qualitative).

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO1 To understand properties of solids with different types of moduli and to gain knowledge about absorption coefficients of solids and different surfaces.

CO2 To understand basic concepts of high frequency sound waves and its applications.

CO3 To understand basic concepts of quantum mechanical behavior of wave and particle along with applications.

CO4 To understand the concepts of production of laser and its behavior with diffraction principle of interference.

CO5 To apply the concept of polarization phenomenon and thereby its applications in fiber optic communication.

TEXT BOOKS

1. R.K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi (2003)
2. Jayaprakash R.N, 'Engineering Physics - I', Dhanam Publications, Chennai, (2007).

REFERENCE BOOKS

1. R. Murugeshan , Kiruthiga Sivaprasath ,Modern Physics S. Chand publications 2016,NewDelhi.
2. A. Ghatak Optics The McGraw-Hill Companies, Inc., 1221 Avenue of the Americas, NewYork, NY 10020.
3. Dr.M.N.Avadhanulu, Introduction to Lasers: theory and applications S.Chand publications2012,New Delhi.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3	2										2	2		1
CO2	3	2			3							2	2		
CO3	3	2			3							2	2	2	
CO4	3	2			3							2		2	
CO5	3	2			3		2					2		2	1

118CYT04 **ENGINEERING CHEMISTRY** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To make the students conversant with boiler feed water requirements, related problems and water treatmenttechniques.
- To recall the terminologies of electrochemistry and explain the function of batteries and fuel cells with itselectrochemical reactions.
- To understand the fundamentals of corrosion, its types and polymers with its applications.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.

UNIT I WATER AND ITS TREATMENT 9

Hardness of water - types - expression of hardness - units - estimation of hardness of water by EDTA - numerical problems- boiler troubles (scale and sludge) - treatment of boiler feed water - Internal treatment (carbonate, colloidal, phosphate and calgon conditioning) external treatment Ion exchange process, zeolite process - desalination of brackish water - Reverse Osmosis.

UNIT II ELECTROCHEMISTRY AND ENERGY STORAGE DEVICES 9

Electrochemical cell-single electrode potential-standard electrode potential-electrochemical series and its significance- EMF of a cell- Nernst equation -Electrodes-Reference electrodes-hydrogen, calomel, quinhydrone and glass electrodes. Determination of pH of a solution using a glass electrode. Batteries - primary and secondary cells, dry cell, alkaline, lead acid storage cell, Ni-Cd battery and lithium nano battery. Clean energy fuel cells - H_2-O_2 fuel cell.

UNIT III CORROSION SCIENCE 9

Corrosion: definition - types of corrosion: chemical and electrochemical corrosion – Pilling Bedworth ratio - types of oxidelayer (stable, unstable, volatile, porous) - hydrogen evolution and oxygen absorption mechanism for electrochemical corrosion - mechanism for rusting of iron. Types of electrochemical corrosion: Galvanic corrosion - differential aeration corrosion (pitting, waterline and pipeline). Galvanic series - applications. Factors influencing corrosion: nature of metal and environment. Corrosion control methods: sacrificial anode method - impressed current Cathodic

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

protection method - electroplating - electroless plating.

UNIT IV POLYMERS AND ITS PROCESSING 9

Advantages of polymers over metals. Monomers - polymers - polymerization - functionality – degree of polymerization -classification of polymers based on source and applications - Molecular weight determination. Types of polymerization: addition, condensation and copolymerization - mechanism of free radical polymerization. Preparation, properties and applications of thermosetting (epoxy resin and Bakelite) and thermoplastics (polyvinyl chloride and polytetrafluoroethylene). Compounding of plastics - injection and extrusion moulding methods.

UNIT V FUELS AND COMBUSTION 9

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking- octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. **Combustion of fuels:** Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range- flue gas analysis (ORSAT Method).

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO1 Attribute the internal and external treatment methods for the removal of hardness in water for domestic andindustrial applications.

CO2 Construct an electrochemical cell and Identify the components and processes in batteries and infer the selectioncriteria for commercial battery systems with respect to different applications.

CO3 Utilize electrochemical data to formulate an electrochemical half-cell and cell reactions for corrosion controlprocesses.

CO4 Differentiate the polymers used in day to day life based on its source, properties and applications.

CO5 Analyse the three types of fuels based on calorific value for selected application.

TEXT BOOKS

1. S. S. Dara and S. S. Umare, “A Textbook of Engineering Chemistry”, S. Chand & Company LTD, New Delhi,2015
2. P. C. Jain and Monika Jain, “Engineering Chemistry” Dhanpat Rai Publishing Company (P) LTD, New Delhi,2015
3. S. Vairam, P. Kalyani and Suba Ramesh, “Engineering Chemistry”, Wiley India PVT, LTD, New Delhi, 2013.

REFERENCE BOOKS

1. Friedrich Emich, “Engineering Chemistry”, Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, “Engineering Chemistry”, Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, “Engineering Chemistry-Fundamentals and Applications”, Cambridge University Press, Delhi,2015.

COs	Programme Outcomes	Programme Specific Outcomes

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2													
CO2	3	2		2											
CO3	3	2		3											
CO4	3	2		3											
CO5	2	3		3											

118PPT05 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C

3 0 0 3

COURSE OBJECTIVES

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocksof algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: findminimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter andinteractive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters andarguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance betweentwo points.

UNIT III CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean valuesand operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, date and time, errors and exceptions, handling exceptions, debugging, modules, packages; Illustrative programs: word count, copy file.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon completion of the course, students will be able to:

CO1 Develop algorithmic solutions to simple computational problems

CO2 Read, write, execute by hand simple Python programs.

CO3 Structure simple Python programs for solving problems.

CO4 Decompose a Python program into functions.

CO5 Represent compound data using Python lists, tuples, dictionaries.

TEXT BOOKS

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated forPython3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2,Network Theory Ltd., 2011.

REFERENCE BOOKS

1. John V Guttag, —Introduction to Computation and Programming Using Python'', Revised and expandedEdition, MIT Press, 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-Disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, —Exploring Python‖, Mc-Graw Hill Education(India) Private Ltd., 2015.
4. Kenneth A. Lambert, —Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
5. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus,Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to ComputerScience using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3			2					2		2			
CO2			2							2		2			1
CO3			2							2		2		2	
CO4	3	3	2		2					2		2			1
CO5			2							2		2		2	
CO6			2							2		2			

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

ELECTIVE (GROUP-I)

118ESE01	BASIC CIVIL AND MECHANICAL ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To gain the knowledge on civil works like masonry, roofing, flooring and plastering.
- To gain the knowledge on stress, strain of various building and foundations.
- The students should familiar with foundry, welding and forging processes.
- The students should familiar working principle of IC engines and its types.
- To gain the knowledge about various energy resources and refrigeration air condition systems.

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 9

Surveying: Objects, types, classification, principles, measurements of distances, angles, leveling, determination of areas, illustrative examples. **Civil Engineering Materials:** Bricks, stones, sand, cement, concrete, steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES 10

Foundations: Types, Bearing capacity, Requirement of good foundations. **Superstructure:** Brick masonry, stone masonry, beams, columns, lintels, roofing, flooring, plastering, Mechanics, Internal and external forces, Stress, Strain, Elasticity, Types of Bridges and Dams, Basics of Interior Design and Landscaping.

B – MECHANICAL ENGINEERING

UNIT III FOUNDRY WELDING AND FORGING 10

Foundry: Introduction - Patterns –materials. Types of pattern and pattern allowances. Molding sand, types and properties,Molding procedure. **Welding:** Definition and Classification, Gas welding, Oxy Acetylene welding, Types of flames, advantages and disadvantages of gas welding. Resistance welding - Classification, Spot welding and Seam welding. Soldering, Definition and Classification. Brazing – Definition and Classification. **Forging:** Types of Forging, Differencesbetween Hot working and Cold working processes.

UNIT IV I C ENGINES& BOILERS 8

Internal combustion engines, Working principle of Petrol and Diesel Engines, Four stroke and Two stroke cycles, Comparison of four stroke and two stroke engines, Boilers: Introduction of boilers, classification, Lancashire boiler, Babcock and Wilcox boiler, list of boiler mountings and accessories and applications (no sketches).

UNIT V SOURCE OF ENERGY & REFRIGERATION 8

Sources of energy: Introduction, conventional and non-conventional sources of energy, examples, solar energy, hydro power plant. Introduction to refrigeration and air-conditioning, COP, properties of refrigerants and types of refrigerants, working principle of vapour compression & vapour absorption refrigeration system, Layout of typical domestic refrigerator, Window and Split type room Air conditioner.

TOTAL:45 PERIODS

COURSE OUTCOMES

The students are able to understand:

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO1 The usage of surveying and properties of construction materials.

CO2 The stress strain of various building and material such as substructure, road transport and bridge.

CO3 The concept of manufacturing methods encountered in engineering practice such as foundry, welding andforging processes.

CO4 The working of internal combustion engines and its types.

CO5 The concept of energy conservation in practical, power plant refrigeration air condition and its types.

TEXT BOOKS

1. Ranganath G and Channankaiah, "Basic Engineering Civil & Mechanical", S.S.Publishers, 2014.
2. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill PublishingCo., New Delhi, 3rd Edition, 2012.

REFERENCE BOOKS

1. Venugopal.K and Prabhu Raja.V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, 2015.
2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd, 3rd Edition reprint, 2013.
3. Shanmuga sundaram. S and Mylsamy. K, "Basics of Civil and Mechanical Engineering", Cenage LearningIndiaPvt.Ltd, NewDelhi, 2012.
4. Khanna O.P, Foundry Technology, Dhanpat Rai Publishing Co. (P) Ltd, 2011.
5. Shanmugam G., "Basic Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 2010.
6. Gopalakrishna K R, "Elements of Mechanical Engineering", Subhas Publications, Bangalore, 2008.
7. Shantha Kumar S R J, "Basic Mechanical Engineering", Hi-Tech Publications, Mayiladuthurai, 2001.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3											2		3	2
CO2	3	2			2		1						3		
CO3	3	2										2	3	2	1
CO4	3	2			2							2	2	1	
CO5	2						1					2	1		1

118ESE05 **BASIC MECHANICAL, ELECTRICAL, AND INSTRUMENTATION ENGINEERING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- The students should familiar with foundry and welding processes.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

- The students should familiar with working principle of IC engines and to gain the knowledge about variousenergy resources, refrigeration and air conditioning systems.
- To learn the basics of electrical elements.
- To introduce the fundamental concepts of DC and AC circuits.
- To understand the principles of measurement systems and transducers

PART-A (MECHANICAL)

UNIT I INTRODUCTION TO FOUNDRY AND WELDING 8

Foundry: Introduction - Patterns –materials. Types of pattern and pattern allowances. Molding sand, types and properties,Molding procedure. Welding: Definition and Classification, Gas welding, Oxy Acetylene welding, Types of flames, advantages and disadvantages of gas welding. Resistance welding - Classification, Spot welding and Seam welding. Soldering - Definition and Classification. Brazing – Definition and Classification.

UNIT II I C ENGINES, SOURCE OF ENERGY & REFRIGERATION 10

Internal combustion engines, Working principle of Petrol and Diesel Engines, Four stroke and Two stroke cycles, Comparison of four stroke and two stroke engines.

Sources of energy: Introduction, conventional and non-conventional sources of energy, examples, solar energy. Introduction to refrigeration and air-conditioning, COP, properties of refrigerants and types of refrigerants, working principle of vapour compression & vapour absorption refrigeration system, Layout of typical domestic refrigerator, Window and Split type room Air conditioner.

UNIT III INTRODUCTION TO BASIC ELECTRICAL ELEMENTS 9

Electrical circuit : passive elements - Resistor, Inductor and Capacitor; active elements- Current, Voltage, Power and Energy – Ohm's Law and limitations - Kirchhoff's Laws – relationship between current, voltage and power – Resistors inseries, parallel and series -parallel circuits.

UNIT IV FUNDAMENTALS OF DC AND AC CIRCUITS 9

DC Circuits: Sources of Electrical Energy - Independent and Dependent Source, Source Conversion - Star –Delta conversion- Mesh and Nodal Analysis.

AC Circuits: Generation of sinusoidal - voltage, average - RMS value, form factor and peak factor- Phasor diagrams of R,L, C, combination of R-L, R-C and R-L-C circuits

UNIT V MEASUREMENT SYSTEMS AND TRANSDUCERS 9

Measurements-Significance of measurements-Methods of Measurement-Direct methods, indirect methods-Instrument and measurement systems-Mechanical, Electrical and Electronic instruments-Classification of instruments- characteristics of instruments and measurement systems-Errors-Type of Errors –Units and Standards. Moving coil and moving iron meters,Energy meter and watt meter. Transducers- RTD, Strain gauge, LVDT.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1 Learn the concept of manufacturing methods encountered in engineering practice such as foundry and weldingprocesses

CO2 Know the working of internal combustion engines and the concept of sources of energy, working principle ofrefrigeration and air conditioning

CO3 Recognize the different combinations of circuit elements and solving the circuit by applying basic circuitallaws.

CO4 Acquire a good understanding of DC and AC circuits.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO5 Understand the principles of measurement systems and transducers.

TEXT BOOKS

1. Ranganath G and Channankaiah, "Basic Engineering Civil & Mechanical", S.S.Publishers, 2014.
2. Shanmugam G., "Basic Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 2010.
3. Muthusubramanian R, Salivahanan S, "Basic Electrical and Electronics Engineering", Tata McGraw HillEducation Private Limited, 2010.
4. A.K.Sawhney,"A course in Electrical and Electronic Measurements and Instrumentation" Dhanpat Rai & Co,2016.

REFERENCE BOOKS

1. Shanmugasundaram. S and Mylsamy. K, "Basics of Civil and Mechanical Engineering", Cenage LearningIndia Pvt.Ltd, NewDelhi, 2012.
2. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw HillPublishing Co., New Delhi, 3rd Edition, 2012.
3. Venugopal.K and PrabhuRaja.V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam,2015.
4. B.L.Theraja, A.K.Theraja, "A Text Book of Electrical Technology, Volume I ", S.Chand and company Ltd.,2006.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3					1									
CO2	3														
CO3	3		1		2	1						1	2	1	
CO4	3					1						1	2		1
CO5	3				2	1						1	2	1	

118ESE06 **BASIC ELECTRICAL ELECTRONICS AND INSTRUMENTATION ENGINEERING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To learn the basics of electrical elements.
- To introduce the fundamental concepts of DC and AC circuits.
- To interpret the principle and characteristics of semiconductor devices.
- To analyze the various logic gates and switching theory.
- To understand the principles of measurement systems and transducers.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT I INTRODUCTION TO BASIC ELECTRICAL ELEMENTS 9

Electrical circuit: passive elements - Resistor, Inductor and Capacitor; active elements- Current, Voltage, Power and Energy – Ohm's Law and limitations - Kirchhoff's Laws – relationship between current, voltage and power – Resistors inseries, parallel and series -parallel circuits.

UNIT II FUNDAMENTALS OF DC AND AC CIRCUITS 9

DC Circuits: Sources of Electrical Energy - Independent and Dependent Source,
Source Conversion - Star –Delta conversion- Mesh and Nodal Analysis.

AC Circuits: Generation of sinusoidal - voltage, average - RMS value, form factor and peak factor- Phasor diagramsofR, L, C, combination of R-L, R-C and R-L-C circuits.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 9

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full waveRectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT IV DIGITAL ELECTRONICS 9

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters– A/D and D/A Conversion (single concepts).

UNIT V MEASUREMENT SYSTEMS AND TRANSDUCERS 9

Measurements-Significance of Measurements-Methods of Measurement-Direct methods, indirect methods-Instrument andmeasurement systems-Mechanical, Electrical and Electronic instruments-Classification of instruments- characteristics of instruments and measurement systems-Errors-Type of Errors –Units and Standards. Moving coil and moving iron meters,Energy meter and watt meter. Transducers- RTD, Strain gauge, LVDT.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon completion of the course, students will be able to:

CO1 Recognize the different combinations of circuit elements and solving the circuit by applying basic circuital laws.

CO2 Acquire a good understanding of DC and AC circuits.

CO3 Demonstrate the characteristics of semiconductor devices.

CO4 Design the various logic gates for switching applications.

CO5 Understand the principles of measurement systems and transducers.

TEXT BOOKS

1. Muthusubramanian R, Salivahanan S, "Basic Electrical and Electronics Engineering", Tata McGrawHillEducation Private Limited, 2010.
2. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 / Pearson Education(Singapore) Pvt. Ltd., New Delhi, 2003.
3. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 9thEdition, Pearson Education/ PHI, 2007.
4. A.K.Sawhney, "A course in Electrical and Electronic Measurements and Instrumentation" Dhanpat Rai &Co,2016.

REFERENCE BOOKS

1. B.L.Theraja, A.K.Theraja, "A Text Book of Electrical Technology, Volume I ", S.Chand and company Ltd.,2006.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3											2		
CO2	3	3											2		
CO3	3	3							2				2	2	1
CO4	3	3													1
CO5	3	3							2					2	

118ESE07 **BIOLOGY FOR ENGINEERS** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To familiarize the basic organization of organisms and subsequent building to a living being
- To provide knowledge about biological problems that require engineering expertise to solve them
- To understand the concepts of enzymes and its industrial applications
- To impart an understanding about the machinery of the cell functions that is ultimately responsible for variousdaily activities.
- To know about the nervous system, immune system and cell signaling

UNIT I BASIC CELL BIOLOGY 9

Introduction: Methods of Science-Living Organisms: Cells and Cell theory Cell Structure and Function, Genetic information, protein synthesis, and protein structure, transcription, translation, Cell metabolism-Homoeostasis-Cell growth, reproduction, and differentiation.

UNIT II BIOCHEMISTRY AND MOLECULAR ASPECTS OF LIFE 9

Biological Diversity --Chemistry of life: chemical bonds--Biochemistry and Human biology--Protein synthesis- Protein Folding- Bioinformatics- Disease detection – PCR and electrophoresis-clone and DNA sequencing -Stem cells and Tissue engineering.

UNIT III ENZYMES AND INDUSTRIAL APPLICATIONS 9

Enzymes: Biological catalysts, Proteases, Carbonic anhydrase, Restriction enzymes, and Nucleoside monophosphate kinases – Photosynthesis, DNA replication, protein synthesis.

UNIT IV MECHANOCHEMISTRY 9

Molecular Machines/Motors – Cytoskeleton – Bioremediation- phytoremediation, mycoremediation –Biosensors- Principle, Immobilization of biological components, Molecular recognition –Biological recognition agents, Application ofBiosensors-Biosensors for Clinical Chemistry

UNIT V NERVOUS SYSTEM, IMMUNE SYSTEM AND CELL SIGNALING 9

Nervous system- central Nervous system, Peripheral, Nervous system. Immune system- innate immune system, Adaptiveimmune system, Neuro-immune system - General principles of cell

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

signaling- classification, Signal Pathway.

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student should able:

CO1 To familiarize the basic organization of organisms and subsequent building to a living being

CO2 To provide knowledge about biological problems that require engineering expertise to solve them

CO3 To understand the concepts of enzymes and its industrial applications

CO4 To impart an understanding about the machinery of the cell functions that is ultimately responsible for variousdaily activities.

CO5 To know about the nervous system, immune system and cell signaling

TEXT BOOKS

1. ThyagaRajan S, Selvamurugan N, Rajesh M. P, Nazeer, Richard Thilagaraj R.A, Barathi. W.S and. Jaganthan. M.K "Biology for Engineers," Tata McGraw-Hill, New Delhi, 2012.

REFERENCE BOOKS

1. Jeremy M, Berg John.L, Tymoczko and LubertStryer, "Biochemistry," W.H. Freeman and Co. Ltd., 6th Ed., 2006.
2. Robert Weaver, "Molecular Biology," MCGraw-Hill, 5th Edition, 2012.
3. Jon Cooper, "Biosensors A Practical Approach" Bellwether Books, 2004.
4. Martin Alexander, "Biodegradation and Bioremediation," Academic Press,1994.
5. Kenneth Murphy, "Janeway's Immunobiology," Garland Science; 8th edition, 2011.
6. Eric. R, Kandel, James.H, Schwartz, Thomas. M, Jessell, "Principles of Neural Science", Mc-Graw Hill, 5thEdition, 2012.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1		2					3		2				2	1	
CO2						2				2				1	
CO3							2						2		
CO4						2	3					2			
CO5			1				3						3	2	1

118PHP07 **ENGINEERING PHYSICS LABORATORY**

L	T	P	C
0	0	2	1

COURSE OBJECTIVES

- To understand the practical concepts of Interference and diffraction.
- To understand the concept of velocities of sound in different liquids.
- To get better knowledge of modulus of elasticity.
- To understand the concepts of thermal conductivity.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

- To understand the concepts of viscosities of liquid

LIST OF EXPERIMENTS

1. (a) Determination of laser parameters – Wavelength.

   (b) Particle size determination using Diode Laser.
2. Determination of thickness of a thin wire-Air wedge method.
3. Determination of velocity of sound and compressibility of liquid- Ultrasonic interferometer.
4. Determination of wavelength of mercury spectrum-Spectrometer grating.
5. Determination of thermal conductivity of a bad conductor-Lee's disc method.
6. Determination of Young's modulus of the material –Non uniform bending.
7. Determination of viscosity of liquid – Poiseuille's method.
8. Spectrometer- Dispersive power of prism.
9. Determination of Young's modulus of the material - Uniform bending.
10. Tensional pendulum- Determination of Rigidity modulus.

COURSE OUTCOMES

At the end of the course, the student will be able to

CO1 Understanding the moduli of elasticity by determining Young's modulus and Rigiditymodulus of a beam and cylinder respectively.

CO2 Understanding the phenomenon of diffraction, dispersion and interference of light using opticalcomponent.

CO3 Acquiring knowledge of viscosity by determining coefficient of viscosity of a liquid.

CO4 Measuringthe parameters of ultrasound propagating through a liquid.

CO5 Understanding the phenomenon of heat transfer through conductors and bad conductors by determining thermal conductivity.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2													
CO2	3	2		2											
CO3	3	2		3											
CO4	3	2		3											
CO5	2	1													

		L	T	P	C
118PPP08	**PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY**	**0**	**0**	**2**	**1**

COURSE OBJECTIVES

- To write, test, and debug simple Python programs.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

LIST OF EXPERIMENTS

1. To Implement python scripts using Variables and operators
2. To Demonstrate Operator precedence to evaluate an expression
3. Display grade of a student using elif statement
4. Implement Floyd triangle using for loop
5. Checks the given number is prime or not using while loop
6. Compute the GCD of Numbers using functions
7. Finding factorial of a given number using recursive function.
8. Takes a list of words and returns the length of longest one using strings
9. To perform linear and binary search using strings
10. To implement list as arrays (multiply 2 matrices)
11. To demonstrate use of list & related functions
12. To demonstrate use of tuple, set& related functions
13. To demonstrate use of Dictionary& related functions
14. Finding most frequent words in a text read from a file
15. Programs that take command line arguments (word count)

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon completion of the course, students will be able to:

CO1 Write, test, and debug simple Python programs.
CO2 Implement Python programs with conditionals and loops.
CO3 Develop Python programs step-wise by defining functions and calling them.
CO4 Use Python lists, tuples, dictionaries for representing compound data.
CO5 Read and write data from/to files in Python.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1		3			2					2		2			
CO2			2							2		2		2	
CO3			2							2		2		2	
CO4	3	3	2		2					2		2			
CO5			2							2		2			

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Semester II

		L	T	P	C
218ENT01	**COMMUNICATIVE ENGLISH**	**2**	**0**	**2**	**3**

COURSE OBJECTIVES

- To help learners develop their listening skills which will enable them listen to lectures and comprehendthem by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop grammar and vocabulary of a general kind by developing their reading skills

UNIT I **9**

Listening - conversation - Speaking – introducing oneself - exchanging personal information - Reading – comprehension. Writing - paragraph - Vocabulary Development - synonyms and antonyms - Language Development – consonants &vowels - phonetic transcription.

UNIT II **9**

Listening - telephonic conversation - Speaking – sharing information of a personal kind – greeting taking leave - Reading – short stories – The Gift of the Magi, A Service of Love and The Last Leaf by O. Henry – Writing – developing hints - Vocabulary Development – everyday vocabulary - Language Development – British andAmerican English - infinitive and gerund.

UNIT III **9**

Listening – class memory quiz - Speaking – impromptu - Reading – magazines – Writing – agenda proposals - Vocabulary Development - important words used in speaking and writing - Language Development – typesof sentences - information and emphasis.

UNIT IV **9**

Listening – interviews of famous persons - Speaking – story narration - Reading – case study – Writing – invitation letter- quotation letter - Vocabulary Development – listening and reading vocabulary - Language Development – cause andeffect – purpose and function.

UNIT V **9**

Listening - a scene from a film - Speaking - role play - Reading – jigsaw – Writing – essay writing Vocabulary Development-business vocabulary - Language Development - degrees of comparison real English phrases.

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1 Comprehend conversations and talks delivered in English.

CO2 Participate effectively in formal and informal conversations; introduce themselves and their friends and express opinions in English.

CO3 Read short stories, magazines, novels and other printed texts of a general kind.

CO4 Write short paragraphs, essays, letters and develop hints in English.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO5 Approach the global market with self-confidence

TEXT BOOKS

1. Board of Editors. Using English A Coursebook for Undergarduate Engineers and Technologists. OrientBlackSwan Limited, Hyderabad: 2015.
2. Richards, C. Jack. Interchange Students' Book-2, New Delhi: CUP, 2015.
3. Uttham Kumar, N. Communicative English (with work book). Sahana Publications, Coimbatore, 2019.

REFERENCE BOOKS

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. New York: Rutledge, 2011.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English.Cambridge University Press, Cambridge: Reprint 2011.
3. Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013.
4. Means, L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning,USA: 2007.
5. Redston, Chris & Gillies Cunningham. Face2Face (Pre-intermediate Student's Book & Workbook).Cambridge University Press, New Delhi: 2005.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1		1		2	2								2		
CO2	1		2	2	2					2				2	1
CO3			2	3	2									2	1
CO4		2	1		3								1		
CO5	3									3		2			1

218MAT02 **ENGINEERING MATHEMATICS-II**

L	T	P	C
3	1	0	4

COURSE OBJECTIVES

- To revise the concept of integral calculus and introduce Beta and Gamma functions.
- To understand double and triple integration concepts.
- To study vector calculus comprising of surface and volume integrals along with the classical theorems involving them.
- To learn analytic functions and their properties and also conformal mappings with few standard examples those have direct applications.
- To grasp the basics of complex integration and application to contour integration which is important for evaluation of certain integrals encountered in engineering problems.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT I INTEGRAL CALCULUS 9+3

Definite and indefinite integrals - Substitution rule – Techniques of integration –Integration by parts – Trignometric integrals - Trigonometric substitutions - Integration of rational functions by partial fractions – Integration irrational functions - Beta and Gamma functions.

UNIT II MULTIPLE INTEGRALS 9+3

Double integration – Cartesian and polar co-ordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates –Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral.

UNIT III VECTOR CALCULUS 9+3

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal, vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (Statement and applications only) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT IV ANALYTIC FUNCTIONS 9+3

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy– Riemann equation and Sufficient conditions (Statement and applications only) – Harmonic and orthogonal properties of analytic function (Statement and applications only) – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z + c, cz, 1/z, and bilinear transformation.

UNIT V COMPLEX INTEGRATION 9+3

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points –Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

TOTAL:45+15 =60 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

CO1 Apply the basic integration concepts and solve problems.

CO2 Determine the area and volume in 2-dimension and 3-dimension respectively using multiple integrals.

CO3 Expertise the concept of vector calculus and apply in core subjects.

CO4 Construct the analytic functions and conformal transformations of complex functions.

CO5 Evaluate the integrals using complex integration.

TEXT BOOKS

1. Grewal. B.S., "Higher Engineering Mathematics", 44th Edition, 2017 Khanna Publications, Delhi.

REFERENCE BOOKS

1. James Stewart, "Stewart Calculus", 8th edition,2015, ISBN: 9781285741550/1285741552.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", tenth edition, Wiley India, 2011.
3. P.Kandasamy, K.Thilagavathy, K.Gunavathy, "Engineering Mathematics for first year", S.Chand & Company Ltd., 9th Edition, New Delhi, 2014.
4. V.Prameelakaladharan and G.Balaji, "Engineering Mathematics - II", Amrutha marketing,

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Chennai, 2018.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1	3	2	2									2	2	2	
CO2	3	3	3									2	2	2	
CO3	3	3	3									2	2	2	
CO4	3	3	2									2	2	2	
CO5	3	3	2									2	2	2	

218GET03 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C

2 0 0 2

COURSE OBJECTIVES

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmentalproblems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision thesurrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.

UNIT I NATURAL RESOURCES 14

Definition, scope and importance of environment – need for public awareness - Forest resources: Use and over- exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of localarea to document environmental assets – river / forest / grassland / hill / mountain.

UNIT II ECOSYSTEMS AND BIODIVERSITY 8

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers –energy flow in the ecosystem – ecological succession – food chains, food

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic,species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India –conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes.

UNIT III ENVIRONMENTAL POLLUTION 10

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marinepollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal wastes – role of an individual in prevention of pollution – pollution case studies – disastermanagement: floods.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and humanhealth – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO1 Gain knowledge about environment and ecosystem.

CO2 Learn about natural resource, its importance and environmental impacts of human activities on natural resource.

CO3 Gain knowledge about the conservation of biodiversity and its importance.

CO4 Aware about problems of environmental pollution, its impact on human and ecosystem and control measures.

CO5 Learn about increase in population growth and its impact on environment.

TEXT BOOKS

1. Benny Joseph, Environmental Science and Engineering ‘, Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M. Masters, Introduction to Environmental Engineering and Science ‘, 2nd edition, PearsonEducation, 2004.
3. Dr. G. Ranganath, Environmental Science and Engineering, Sahana Publishers, 2018 edition.

REFERENCE BOOKS

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

1. Dharmendra S. Sengar, Environmental law ', Prentice hall of India PVT LTD, New Delhi, 2007.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	2					2	3						2		
CO2	2					2							3		1
CO3	2					2	3						2		
CO4	2				1	2	3						2		1
CO5	2				1	2	3						2		

218EGT05 ENGINEERING GRAPHICS L T P C

2 0 4 4

COURSE OBJECTIVES

- To understand the graphical skills for drawing the object and the principle of free-hand sketchingtechniques.
- To understand the principle of orthographic projection of points, lines and plane surfaces.
- To study the principle of simple solids.
- To understand the principle of section and development of solids.
- To understand the principle of Isometric and Perspective projections.

Concepts and conventions (Not for Examination) 3

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions andspecifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING 15

Curves used in engineering practices:

Conics – Construction of ellipse, Parabola and hyperbola by Eccentricity method – Construction of cycloid– Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Freehand sketching:

Representation of Three Dimensional objects – General principles of orthographic projection – Need forimportance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 15

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS 15

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Projection of simple solids like prisms, pyramids, cylinders and cones when the axis is inclined to one referenceplane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 15

Sectioning of simple solids like prisms, pyramids, cylinders and cones in simple vertical position by cuttingplanes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones– Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 12

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms,pyramids, cylinders and cones.

Perspective projection of prisms, pyramids and cylinders by visual ray method.

TOTAL:75 PERIODS

COURSE OUTCOMES

The student will be able to

CO1 Recognize the conventions and apply dimensioning concepts while drafting simple objects.

CO2 Draw the orthographic projection of points, line, and plane surfaces.

CO3 Draw the orthographic projection of simple solids.

CO4 Draw the section of solid drawings and development of surfaces of the given objects.

CO5 Apply the concepts of isometric and perspective projection in engineering practice.

TEXT BOOKS

1. Ranganath G, Channankaiah and Halesh Koti, “Engineering Graphics”, Second Edition, SahanaPublishers, 2015.
2. Bhatt. N.D., “Engineering Drawing” Charotar Publishing House, 53rd Edition, 2014.

REFERENCE BOOKS

1. Dhananjay A.Jolhe, “Engineering Drawing with an introduction to AutoCAD” Tata McGraw HillPublishing Company Limited, 2017.
2. Gopalakrishnana. K. R, “Engineering Drawing” (Vol. I & II), Subhas Publications, 2014.
3. Basant Agarwal and C.M.Agarwal, “Engineering Drawing”, Tata McGraw Hill, 2013.
4. Natrajan K. V, “A Text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2012.
5. M.B.Shaw and B.C.Rana, “Engineering Drawing”, Pearson Education India, 2011.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2											3		2
CO2	3	3									1			2	1
CO3	3	3									2		1		
CO4	3	3											3	2	1
CO5	3														

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

215CAT05	CIRCUIT THEORY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To enable the student to learn the major components of a circuit theory.
- To know the correct andefficient ways of handling electrical circuits.

UNIT I BASIC CIRCUITS CONCEPTS AND ANALYSIS 9

Circuit elements, ideal sources (independent and dependent), linear passive element R, L and C; V-I relationshipof circuit elements; sinusoidal voltage and current- RMS value, Average value, form factor, power and power factor; Ohm's Law – Kirchoff's Laws; analysis of series and parallel circuits: Network reduction; voltage and current division, source transformation, star/delta transformation.

UNIT II MULTI DIMENSIONAL CIRCUIT ANALYSIS & NETWEORK THEOREMS 9

Node voltage analysis of multi node circuit with current sources and Mesh-current analysis of multi node circuits with voltage sources for DC and AC circuits. Network Theorems for DC and AC circuits: Thevenin's theorem- Norton's theorem – Superposition theorem – Maximum power transfer theorem – Reciprocity theorem- compensation theorem – substitution theorem- Millman's theorem- Tellegen's theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance – their frequency response – Quality factor and Bandwidth. Magnetically coupledcircuits- Self and mutual inductance –Coefficient of coupling-Dot conversion; Tuned circuits – Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 9

Source free response of RL and RC circuits; forced (step) response of RL and RC circuits; source free response ofRLC series circuit; forced (step) response of RLC series circuit; forced response of RL, RC and RLC series circuitto sinusoidal excitation; time constant and natural frequency of oscillation of circuits. Laplace Transform application to the solution of RL, RC & RLC circuits: Initial and final value theorems and applications.

UNIT V ANALYSING THREE PHASE CIRCUITS 9

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

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1 Recognize the different combinations of circuit elements and solving the circuit by applying basic circuital laws irrespective of the type of steady state source given.

CO2 Analyse electrical circuits by applying theorems.

CO3 Understand the concepts of series and parallel resonance.

CO4 Recall the basic concepts of laplace transform and thus analyse the transient behavior of electrical Circuits

CO5 Explain the way of generation of alternating voltage and the response of single phase

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

circuits and three phase circuits employing balanced and unbalanced loads.

TEXT BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis",TMH publishers, 6th edition, New Delhi, 2002.
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGrawHill, 2007.
3. Ravish R Singh, "Network Analysis and Synthesis", McGraw Hill, 2013.

REFERENCE BOOKS

1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., NewDelhi, 1996.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum'sseries,Tata McGraw- Hill,New Delhi 2001.
3. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
4. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2003.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3					1								1	
CO2	3		1		2							1	2		
CO3	3		1		2							1	2		
CO4	3					1						1	2		
CO5	3				2	1						1	2	1	

X18MCT01 **INDIAN CONSTITUTION** **L T P C**

1 0 0 0

COURSE OBJECTIVES

- To know about Indian constitution
- To know about central and state government functionalities in India
- To know about Indian society

UNIT I INTRODUCTION **3**

Historical Background – Constituent Assembly of India – Philosophical foundations of theIndian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT **3**

Union Government – Structures of the Union Government and Functions – President – Vice President– Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT 3

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV CONSTITUTION FUNCTIONS 3

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary.

UNIT V INDIAN SOCIETY 3

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

TOTAL:15 PERIODS

Course Outcomes:

CO1 Understand the functions of the Indian government.

CO2 Understand and abide the rules of the Indian constitution.

CO3 Understand and appreciate different culture.

TEXT BOOKS

1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, NewDelhi, 2013.
2. R.C.Agarwal, "Indian Political System", S.Chand and Company, New Delhi, 1997.

REFERENCE BOOKS

1. Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India,New Delhi.
2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalandhar.

ELECTIVE (GROUP-2)

218BSE03	CHEMISTRY FOR TECHNOLOGISTS	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To get ample knowledge about gaseous properties.
- To acquire knowledge about the properties of solutions.
- To apply the basic concepts of thermodynamics for engineering stream
- To understand the mechanistic pathway of chemical reactions.
- To impart an adequate knowledge about dyes and drugs.

UNIT I THEORY OF GASES AND LIQUIDS 9

Measurable properties of gases, Gas Laws-Boyles law, Charle's law, Graham's law of diffusion, Avogadro's law, Dalton's law of partial pressure, Absolute scale of temperature, Ideal gas equation. Postulates of Kinetic theory of gases-average-root mean square and most probable velocities-real gases-deviation from ideal behaviour-Compressibility factor-Vander walls equation.

Properties of Liquids-Vapour Pressure-Viscosity-surface tension and effect of temperature on various properties.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT II PROPERTIES OF SOLUTION 9

Different methods for expressing concentration of solution - molality, molarity, mole fraction, percentage (by volumeand mass both), vapour pressure of solutions and Raoult's Law - Ideal and non-ideal solutions, vapour pressure - composition, plots for ideal and non-ideal solutions; Colligative properties- Determination of molecular mass using colligative properties; Abnormal value of molar mass, Van't Hoff factor and its significance.

UNIT III CHEMICAL THERMODYNAMICS 9

Terminologies- System, Surroundings-First law of Thermodynamics-Internal energy and enthalpy of System-Second law of Thermodynamics-entropy of a system-entropy change for an ideal gas-entropy change accompanying change of Phase-Gibbs Helmholtz equation-Clausius –clapeyron equation-Applications-Maxwell relation-Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT IV REACTION MECHANISMS AND INTERMEDIATES 9

Introduction-kinetics, equilibria and energetics of reaction-nucleophilic substitution-addition-elimination-electrophilic substitution in aromatic systems. Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes,benzynes, nitrenes ylides and enamines.

UNIT V SOURCE OF ENERGY & REFRIGERATION 8

Classification and properties of drugs. Penicillin sulpha drugs, mode of action, synthesis of sulphanilamide, chloroquine and chloramphenicol. Colour and constitution, chromogen and chromophore. Classification of dyes based on structure and mode of dyeing. Synthesis of dyes. Malachite green, methyl orange, Congo red, phenolphthalein.

TOTAL:45 PERIODS

COURSE OUTCOMES

The students are able to:

CO1 Apply gas laws in various real life situations.

CO2 Explain the characteristic properties and behaviour of solutions.

CO3 Apply the basic concepts of thermodynamics for engineering stream.

CO4 Be familiar in reaction pathways

CO5 Understand the chemistry behind dyes and drugs.

TEXT BOOKS

1. Jerry March Organic Reaction Mechanism John Weily Ed, 5 2002.
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi,2013.

REFERENCE BOOKS

1. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge UniversityPress, Delhi, 2015
2. Puri BR, Sharma LR, Patha nia S, "Principles of Physical Chemistry", 42nd Edition, 2008, VishalPublishing Co., Jalandhar
3. Morrison RT, Boyd RN, Bhattacharjee SK, "Organic Chemistry", 7Th Edition, Pearson India,2011.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2											1		
CO2	3	3	1		2				2				2	2	
CO3	3	2											2	2	1
CO4	3	2											2	2	
CO5	3	1												2	1

218BSE04 ENERGY STORAGE DEVICES AND FUEL CELLS L T P C

2 0 0 2

COURSE OBJECTIVES

- Understand the concept, working of different types of batteries and analyze batteries used in electricvehicles.
- Identify the types of fuel cells and to relate the factors of energy and environment.
- Analyze various energy storage devices and fuel cells.

UNIT I BASICS OF CELLS AND BATTERIES 9

Components - classification - operation of a cell - theoretical cell voltage - capacity - specific energy- energy density of practical batteries - charge efficiency- charge rate - charge retention - closed circuit voltage,open circuit voltage current density - cycle life - discharge rate-over charge-over discharge.

UNIT II BATTERIES FOR PORTABLE DEVICES AND ELECTRIC VEHICLES 9

Primary batteries- zinc-carbon, magnesium, alkaline, manganous dioxide, mercuric oxide, silver oxide batteries - recycling/safe disposal of used cells. Secondary batteries - introduction, cell reactions, cell representations and applications - lead acid, nickel-cadmium and lithium ion batteries - rechargeable zinc alkaline battery. Reserve batteries: Zinc-silver oxide, lithium anode cell, photo-galvanic cells. Battery specifications for cars and automobiles.

UNIT III TYPES OF FUEL CELLS 9

Importance and classification of fuel cells - description, working principle, components, applications and environmentalaspects of the following types of fuel cells: alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate and directmethanol fuel cells.

UNIT IV HYDROGEN AS A FUEL 9

Sources and production of hydrogen - electrolysis - photocatalytic water splitting - biomass pyrolysis -gas clean up-methods of hydrogen storage- high pressurized gas - liquid hydrogen type metal hydride - hydrogen as engine fuel- features, application of hydrogen technologies in the future - limitations.

UNIT V ENERGY AND ENVIRONMENT 9

Future prospects of renewable energy and efficiency of renewable fuels - economy of hydrogen energy - life cycle assessment of fuel cell systems. Solar Cells: energy conversion devices, photovoltaic and photo electrochemical cells -photo biochemical conversion cell.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO1 Understand the knowledge of various energy storing devices.

CO2 Acquire the knowledge to analyze the working of different types of primary and secondary batteries.

CO3 Differentiate the types of fuel cells and recognize the utility of hydrogen as a fuel.

CO4 Realize the importance of using green fuel for sustainable development.

TEXT BOOKS

1. M. Aulice Scibioh and B. Viswanathan, Fuel Cells: Principles and Applications, University Press,India, 2009.
2. F. Barbir, PEM fuel cells: Theory and practice, Elsevier, Burlington, MA, Academic Press, 2013.

REFERENCE BOOKS

1. M. R. Dell Ronald and A. J. David, Understanding Batteries, Royal Society of Chemistry, 2001.
2. J. S. Newman and K. E. Thomas-Alyea, Electrochemical Systems, Wiley, Hoboken, NJ, 2012.
3. Shripad T. Revankar, Pradip Majumdar, Fuel Cells: Principles, Design, and Analysis, CRC Press, 2016.
4. Thomas B. Reddy, Linden's Handbook of Batteries, 4th Edition, McGraw Hill Professional, 2010.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3														
CO2	3		3			3				1			3	2	1
CO3	3			3				2			2		2		1
CO4	3														

218BSE07 **PHYSICS OF SEMICONDUCTOR** **L T P C**

2 0 0 2

COURSE OBJECTIVES

- To study the basic theory of structure of crystalline materials.
- To understand the essential principles of electrical properties of materials.
- To get the better knowledge of Physics of semiconductor materials.
- Become proficient in magnetic and dielectric properties of materials.
- To understand the essential concepts of nanomaterial devices and applications

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT I CRYSTALLOGRAPHY 9

Crystal structures- Parameters- Bravais lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - Packing factor for SC, BCC, FCC, HCP and Diamond cubic structure - NaCl, ZnS structures(qualitative). Miller indices- unit cell approach.

UNIT II ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory-Expression for electrical conductivity-Thermal conductivity, Expression-Wiedemann- Franz law-Success and failures-Quantum free electron theory-Particle in a finite potential well-Tunneling-Particle in athree dimensional box-degenerate States-Fermi-Dirac statistics-Density of energy states-Energy bands in solids.

UNIT III SEMICONDUCTOR PHYSICS 9

Intrinsic Semiconductors-Energy band diagram-direct and indirect band gap semiconductors - Carrier concentration inintrinsic semiconductors-extrinsic semiconductors-Carrier concentration in N-type & P-type semiconductors (qualitative) –Einsein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions – Ohmic contacts – tunnel diode – Schottky diode- MOS capacitor – power transistor.

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials - Absorption emission and scattering of light in metals, insulators and semiconductors(concepts only) – photo current in a P-N diode – solar cell – LED – Organic LED – Laser diodes – Optical data storage techniques.

UNIT V NANOMATERIAL DEVICES 9

Nano materials: Introduction – Synthesis – Plasma arcing – Chemical vapour deposition – Electro deposition – BallMilling – Sol-Gel method – Spin coating method- photo current in a P-N diode – Solar cell – LED- Properties of nanoparticles and their applications.

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1 Have the necessary understanding on the functioning of crystalline in solids of materials.

CO2 Gain knowledge on classical and quantum electron theories, and energy band structures.

CO3 Acquire knowledge on basics of semiconductor physics and its applications in various devices.

CO4 Get knowledge on magnetic and dielectric properties of materials and theirapplications.

CO5 Understand the basics of nanodevices and applications.

TEXT/ REFERENCE BOOKS

1. Donald Askeland, "Materials Science and Engineering", Cengage Learning IndiaPvt Ltd., 2010.
2. Kasap S.O., "Principles of Electronic Materials and Devices" Tata Mc Graw-Hill2007.
3. Pierret R.F, "Semiconductor Device Fundamentals", Pearson 2006
4. W.D.Callister and D.G.Rethwisch, "Materials Science and Engineering", JohnWiley & Sons,Inc., NewJersey (2010).
5. Hanson G.W., "Fundamentals of Nanoelectronics", Pearson Education 2009.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	PO	PO	PSO1	PSO2	PSO3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

										10	11	12			
CO1	3													1	
CO2	3	2	1										1		
CO3	3	2	2										2	2	1
CO4	3	2	1										2	2	1
CO5	2	1											2	1	

218BSE08 **PHYSICS FOR ELECTRONICS ENGINEERING** **L T P C**

2 0 0 2

COURSE OBJECTIVES

- To study the basic theory of structure of crystalline materials.
- To understand the essential principles of electrical properties of materials.
- To get the better knowledge of Physics of semiconductor materials.
- Become proficient in dielectric properties of materials.
- To understand the essential concepts of nanomaterial devices and applications

UNIT I CRYSTALLOGRAPHY 9

Crystal structures- Parameters- Bravais lattice - Calculation of number of atoms per unit cell Atomicradius - Coordination number - Packing factor for SC, BCC, FCC, HCP and Diamondcubic structure-NaCl, ZnS structures (qualitative). Miller indices- unit cell approach.

UNIT II ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory-Expression for electrical conductivity-Thermal conductivity, Expression-Wiedemann-Franz law-Success and failures-Quantum free electron theory- Particle in a finite potential well-Tunneling-Particle in a three dimensional box-degenerate States-Fermi-Dirac statistics-Density of energy states-Energy bands in solids.

UNIT III SEMICONDUCTORS AND TRANSPORT PHYSICS 9

Intrinsic Semiconductors-Energy band diagram-direct and indirect band gap semiconductors Carrier concentration in intrinsic semiconductors-extrinsic semiconductors-Carrier concentration in N-type &P-type semiconductors (qualitative) -Variation of carrier concentration with temperature - Hall effect and devices-Ohmic contacts-Schottky diode.

UNIT IV DIELECTRIC MATERIALS 9

Dielectrics: Dielectric constant - Dielectric loss - Electrical susceptibility- Electronic, ionic - orientational and space charge polarization - Frequency and temperature dependence of polarization -internal field - Claussius - Mosotti relation (derivation) - Thermal conductivityby Lee's disc method for dielectric material.

UNIT V NANOMATERIAL DEVICES 9

Nano materials: Introduction **–** Synthesis – Plasma arcing – Chemical vapour deposition – Electrodeposition – Ball Milling – Sol-Gel method – Spin coating method- photo current ina P-N diode – Solar cell – LED- Properties of nanoparticles and their applications.

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1 Have the necessary understanding on the functioning of crystalline insolids of materials.

CO2 Gain knowledge on classical and quantum electron theories, andenergy band structures.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO3 Acquire knowledge on basics of semiconductor physics and itsapplications in various devices.

CO4 Get knowledge on dielectric properties of materials and their applications.

CO5 Understand the basics of nanodevices and applications.

TEXT/REFERENCE BOOKS

1. Donald Askeland, "Materials Science and Engineering", Cengage LearningIndia PvtLtd., 2010.
2. Kasap S.O., "Principles of Electronic Materials and Devices" Tata McGraw-Hill2007.
3. Pierret R.F, "Semiconductor Device Fundamentals", Pearson 2006
4. W.D.Callister and D.G.Rethwisch, "Materials Science and Engineering",John Wiley& Sons,Inc., New Jersey (2010).
5. Hanson G.W., "Fundamentals of Nanoelectronics", Pearson Education 2009.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	3	2	2	2							2		2	1	
CO3		3	2										2	1	
CO4			3	3				2		2	2		2	2	1
CO5			3	3				2		2	2		2		

218CYP07 **ENGINEERING CHEMISTRY LABORATORY**

L	T	P	C
0	0	2	1

COURSE OBJECTIVES

- Students will be conversant with the estimation of various compounds using volumetric and instrumental analysis.

LIST OF EXPERIMENTS

1. Estimation of Total hardness by EDTA
2. Determination of percentage of calcium in Lime Stone by EDTA
3. Estimation of chloride in water sample
4. Estimation of alkalinity of Water sample
5. Determination of DO in Water (Winkler's Method)
6. Determination of Rate of Corrosion of the given steel specimen by weight loss method (Without inhibitor)
7. Determination of Rate of Corrosion of the given steel specimen by weight loss method (With inhibitor)

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

8. Conduct metric titration (Simple acid base)
9. Conduct metric titration (Mixture of weak and strong acids)
10. Conduct metric titration using $BaCl_2$vs Na_2SO_4
11. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
12. PH titration (acid & base)
13. Determination of water of crystallization of a crystalline salt -Copper sulphate
14. Preparation of Bio-Diesel by Trans etherification method.

A minimum of TEN experiments shall be offered.

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Carry out the volumetric experiments and improve the analytical skills.

CO2 Understand the maintenance and usage of analytical instruments and thereby develop their skills in the field of engineering.

CO3 Understand the principle and handling of electrochemical instruments and Spectrophotometer.

CO4 Apply their knowledge for protection of different metals from corrosion by using different inhibitors.

REFERENCE BOOKS

1. Arthur I. Vogel's, "Quantitative Inorganic Analysis including Elementary Instrumental Analysis",ELBS, Group, 7th Edition, 2000.
2. Dr. K .Sivakumar, "Engineering Chemistry lab manual", S.S publishers, 2016.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2													
CO2	3	2		2											
CO3	3	2		3											
CO4	2	1													

218EPP08 ENGINEERING PRACTICE LABORATORY

L	T	P	C
0	0	2	1

COURSE OBJECTIVES

- To get the knowledge on welding techniques and its types.
- To do the fitting operation on a given material. (Specimen)
- To carry out sheet metal operation.
- To know the principle involved in plumbing work.
- To do the carpentry work on a given work piece.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

LIST OF EXPERIMENTS

WELDING:

Study of Electric Arc welding and Gas welding tools and equipment's.

Preparation of Arc welding and Gas welding models:

i)Butt joint ii) Lap joint iii) T - joint.

FITTING:

Study of fitting tools and operations.

Preparation of fitting models:

i) V-fitting ii) Square fitting

SHEET METAL WORK:

Study of sheet metal tools and operations

Preparation of sheet metal models:

i) Rectangular Tray ii) Funnel

PLUMBING WORKS:

Study of pipeline joints and house hold fittings.

Preparation of plumbing models:

Basic pipe connections with PVC and GI pipe fittings.

CARPENTRY:

Study of wooden joints and tools used in roofs, doors, windows, furniture.

Preparation of carpentry models:

i) Lap joint ii) Dovetail joint iii) T-Joint

DEMONSTRATION ON: ELECTRICAL ENGINEERING PRACTICE

Study of Electrical components and equipments

Residential house wiring using switches, fuse, indicator, lamp and energy meter.

ELECTRONICS ENGINEERING PRACTICE

Study of Electronic components –Resistor, color coding, capacitors etc

Soldering practice –components soldering in simple electric circuit & testing continuity

COMPUTERHARDWARE AND SOFTWARE PRACTICE

Study of PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, PowerPoint and Publisher.

COURSE OUTCOMES

The students will be able to

CO1 Prepare simple Lap, Butt and T- joints using arc welding equipments.

CO2 Prepare the rectangular trays and funnels by conducting sheet metal operation.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

CO3 Prepare the pipe connections and identify the various components used in plumbing.
CO4 Prepare simple wooden joints using wood working tools.
CO5 Demonstrate basic electrical, electronic and computer components based on their physical parameters and dimensions.

TEXT BOOKS:

1. Ranganath. G & Channankaiah, "Engineering Practices Laboratory Manual", S.S. Publishers, 2014.
2. Jeyapoovan.T & Gowri S "Engineering Practice Lab Manual", Vikas publishing house pvt.ltd, 2016.

REFERENCE BOOKS

1. Kannaiah.P & Narayana.K.L, "Manual on Workshop Practice", Scitech Publications, 2015.
2. Ramesh BabuV, "Engineering Practices Laboratory Manual", VRB Publishers Private Limited,Chennai, Revised Edition, 2014.
3. Peter Norton, "Introduction to Computers", 7th Edition, Mc Graw Hill, 2010.
4. Bawa. H.S, "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, 2009.
5. David Anfinson and Ken Quamme, "IT Essentials PC Hardware and Software Companion Guide",CISCO Press, Pearson Education, Third Edition, 2008.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3		1	2					2				2	3	
CO2	3	2	2	2					2				2		1
CO3	3	2	2	2					2				2	3	
CO4	3	1	2	2					2				2		1
CO5	2		2							2		2		3	

218EDP09 ELECTRON DEVICES AND CIRCUITS LABORATORY

L	T	P	C
0	0	2	1

COURSE OBJECTIVES

- To provide exposure to the students with hands on experience on various electrical circuit laws andexperiments.

LIST OF EXPERIMENTS

1. Verification of Kirchoff's laws and ohms laws.
2. Verification of Thevenin's and Norton's Theorem.
3. Verification of Superposition Theorem.
4. Verification of Maximum Power Transfer theorem.
5. Verification of Reciprocity theorem
6. Verification of Mesh and Nodal analysis.
7. Transient response of RL and RC circuits for DC input.
8. Frequency response of series and parallel resonance circuit.
9. Characteristics of PN junction diode and Zener diode Characteristics.
10. Common Emitter and Common Base input-output Characteristics
11. FET and SCR Characteristics

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1 Select the suitable range of meters and rheostats for the given circuit and set the appropriate values of circuit elements and energy sources as per the requirement.

CO2 Apply basic circuital laws to confirm the practical values of the current through and voltage across different elements of the circuit with that of the theoretical values.

CO3 Apply theorems to simplify the electric circuits.

CO4 Illustrate the transient response and frequency response of RLC circuits.

CO5 Study the characteristics of Common Electron Devices.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3														
CO2	3	2			1								3	2	
CO3	2	2											2	3	1
CO4	2	2													
CO5	3	2			1								3	2	

Semester III

		L	T	P	C
318MAT01	**Engineering Mathematics–III**	**3**	**1**	**0**	**4**

COURSE OBJECTIVES

- To learn various methods to solve the partial differential equations.
- To introduce Fourier series analysis which plays a vital role in many applications in engineering.
- To understand the boundary value problems and to obtain the solution using partial differential equations.
- To acquaint the Fourier transform techniques used in wide variety of situations.
- To develop z-transform techniques which analyze the discrete time signals.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Solutions of first order partial differential equations-Standard types-Singular solutions- Lagrange's Linear equation- Solution of homogeneous and non-homogenous linear equations ofsecond and higher order with constant coefficients.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Change of scale - Odd and even functions – Half-range Sine and Cosine series – Parseval's identity – Harmonic Analysis.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT III BOUNDARY VALUE PROBLEMS 9+3

Classification of Partial Differential Equations – Method of separation of Variables – Solutions of one dimensional wave equation and One-dimensional heat equations –Applications using Fourier series solutions in Cartesian coordinates - Steady state solution of two-dimensional heat equation.

UNIT IV FOURIER TRANSFORM 9+3

Fourier integral theorem – Fourier transform pair - Sine and Cosine transforms – Properties – Fourier Transform of simple functions – Convolution theorem (statement and applications only) – Parseval's identity (statement and applications only).

UNIT V Z – TRANSFORM 9+3

Z-Transform - Elementary properties and applications – Initial and final value theorems (Statement and applications only) - Inverse Z-Transform – Partial fractions method, Residue theorem method and Convolution theorem (statement and applications only) - Solution of difference equations by applying Z-transforms.

TOTAL:45+15 = 60 PERIODS

COURSE OUTCOMES

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

CO1 Know the methods to solve partial differential equations occurring in various physical and engineering problems.

CO2 Describe an oscillating function which appears in a variety of physical problems by Fourier series which helps them to understand its basic nature deeply.

CO3 Acquire the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods.

CO4 Apply the Fourier transform techniques in engineering field.

CO5 Gain the concept of analysis of linear discrete system using Z-transform approach.

TEXT BOOKS

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publications, 44th edition, 2017.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition Wiley India, 2016.

REFERENCE BOOKS

1. Andrews L.C and Shivamoggi. B.K., "Integral Transforms for Engineers", SPIE Press Book, 1999
2. Wylie C R and Barrett L C, "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Co., New Delhi, 1995.
3. T.Veerarajan,"Engineering Mathematics-III", Tata McGraw-Hill Publishing company, New Delhi,2015.
4. P.Kandasamy, K.Thilagavathy, K.Gunavathy, " Engineering Mathematics-III", S.Chand Publishers,2015.
5. V.Prameelakaladharan and G.Balaji ,"Engineering Mathematics-III", Amrutha marketing, Chennai,2016.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

CO1	3	2	2									2	2	2	
CO2	3	3	2									2	2	2	
CO3	3	3	3									2	2	2	
CO4	3	2	2									2	2	2	
CO5	3	2	2									2	2	2	

318EET02 **Electro Magnetic Theory** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To introduce the basic mathematical concepts related to electromagnetic fields.
- To understand the concepts of Electrostatics.
- To understand the concepts of Magneto statics.
- To understand the concept of Electromagnetic Fields,
- To understand the concepts of waves and wave propagation.

UNIT I INTRODUCTION **9**

Introduction: Co-ordinate systems and transformation, Cartesian co-ordinates, Circular cylindricalcoordinates, Spherical coordinates and their transformation. Differential length, area and volume indifferent coordinate systems. Numerical problems.

Vector calculus: DEL operator, Gradient of a scalar, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes theorem, Classification of vector fields, Numerical problems.

UNIT II ELECTROSTATIC FIELD **9**

Coulomb's law, field intensity, Gauss's law and applications, Electric potential and Potential gradient, Relation between E and V, Electric dipole and flux lines. Energy density in electrostatic field – Capacitance - Boundary conditions: Conductor –dielectric Poisson's and Laplace's equation.Numerical problems.

UNIT III MAGNETO STATIC FIELDS **9**

Biot- savart law, Ampere's circuital law, Magnetic flux density, Magneto static and Vector potential, Forces due to magnetic field, Magnetic torque, Magnetic material, Magnetic boundary condition, Inductor and Inductances, Magnetic energy density. Numerical problems.

UNIT IV ELECTROMAGNETIC FIELDS **9**

Faraday's law of electromagnetic induction, Transformer and motional Emf, Displacement current, Maxwell's equations, Maxwell's equations in differential and integral form. Relation between field theory and circuit theory Numerical problems.

UNIT V ELECTROMAGNETIC WAVE PROPAGATION **9**

Wave equation, Wave propagation in lossy dielectric, Plane waves in loss less dielectric, Plane wave in free space, Plane wave in good conductor, Skin depth, Power, Poynting vector, Reflection and refraction of a plane wave at normal incidence-Polarization. Numerical problems

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

CO1 Learnt mathematical operations of three dimensional vectors related to electromagnetic fields

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO2 Gained the acquaintance in applications of Poisson's and Laplace's equations

CO3 Acquired the knowledge in applications of Biot-Savart's Law and Ampere's Circuital law.

CO4 Gained the indulgent of the Maxwell's equations and its applications.

CO5 Attained the knowledge in principles of propagation of plane waves.

TEXT BOOKS

1. Mathew N.O. Sadiku ,Elements of Electromagnetic, , 4th edition, Oxford university press. 2007
2. William.H. Hayt& J.A. Buck , Engineering Electromagnetic, , 7th Edition, TMH, 2001
3. Joseph A.Edminister, Theory and problems of Electromagnetic, 2nd Edition, TMH, 1993
4. Guru &Hizroglu , Electromagnetic field theory fundamentals, 2nd edition, CambridgeUniversity Press.2000.

REFERENCE BOOKS

1. Krause ,Electromagnetic with application,5th Edition, TMH. 1999.
2. N.N. Rao ,Elements of Engineering Electromagnetic, 6th Edition, Pearson Education 2000.
3. K. A. Gangadhar and P. M. Ramanathan, 'Electromagnetic Field Theory', Khanna Publishers, Delhi 2009.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1	3	1											3		1
CO2	3	3											2		
CO3	3	3											2		
CO4	3	2											3		
CO5	3	2			1								3	1	

318EET03 Network Analysis and Synthesis

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

To study about

- Time response of RL,RC and RLC circuits for different sources
- Complex frequency, Pole -Zero concepts and Fourier analysis
- One and Two port network parameters
- Design of various filters
- Synthesis of networks

UNIT I DUALITY AND TOPOLOGY **9**

Concept of duality, Dual network, Graphs of a network, Trees, Chords and branches, Tie set and cut set of a graph, Application to network analysis.

UNIT II S- DOMAIN ANALYSIS AND FOURIER ANALYSIS **9**

Concept of complex frequency - Significance of poles and zeros -Necessary conditions for driving point function – Time domain response from pole-zero configurations - Fourier series

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

representationof different waveforms - Trigonometric and complex forms - Fourier integral and Fourier transforms.

UNIT III SINGLE PORT AND TWO PORT NETWORKS 9

Driving point impedance and admittance of single port networks - Two port networks: Z, Y, ABCD and h parameters -Inter relationships of two port network parameters - Image parameters - Interconnection of two port networks - T and π representation- Impedance matching.

UNIT IV FILTERS AND ATTENUATORS 9

Filters: Characteristics of ideal filters - Low pass, High pass and Band pass filters–Constant –k andm – derived filters. Attenuators: T-Type, π-Type, Lattice, Bridged-T and L-Type Attenuator.

UNIT V ELEMENTS OF NETWORK SYNTHESIS 9

Hurwitz polynomials - PR function - Necessary and sufficient conditions of PR function - Propertiesof driving point impedance - Synthesis of LC,RL and RC networks by Foster I ,II and Cauer I , II methods.

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be

CO1 Gained the knowledge of network topology.
CO2 Learnt about apply fourier transforms to analyze electrical networks.
CO3 Learnt network functions and two-port parameters.
CO4 Able to design k and m filters
CO5 Learnt about apply to synthesis techniques

TEXT BOOKS

1. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, TataMcGraw HillPublishers, 4th Edition, 2010.
2. Ravish R Singh, “Network Analysis and Synthesis”, Tata McGraw Hill Publishers, 2013.
3. Arumugam .M and Premkumar .N, Electric circuit theory, Khanna Publishers, New Delhi,2006.
4. G.K. Mithal, “Network Anlaysis”, Khanna Publishers, New Delhi, 2011.

REFERENCE BOOKS

1. Umesh Sinha, “Network Analysis And Synthesis,”Sathya Prakasan Publishers Limited, NewDelhi, Fifth edition, 1992.
2. Soni M.L and Gupta J.C, “Electrical circuit Analysis”, Dhanpat Rai and Sons, Delhi, 1990
3. Edminister, J.A., ‘Theory and Problems of Electric Circuits’, Schaum’s outline series McGraw Hill Book Company, 5thEdition, 2010.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											1		
CO2	3	3	1		2				2				2	2	1
CO3	3	2											2	2	
CO4	3	2											2	2	1
CO5	3	1												2	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

318EET04	Linear Integrated Circuits and Applications	L	T	P	C
		3	0	0	3

Prerequisite: Basic knowledge in Electron Devices and Circuits is required

COURSE OBJECTIVES

- To study the IC fabrication procedures.
- To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.
- To study the applications of Op-amp.
- To study internal functional blocks and the applications of special ICs like Timers, PLL circuits.
- To study the about Application ICs like regulator Circuits.

UNIT I IC FABRICATION 9

Fundamentals of Integrated Circuits, IC classifications, fundamentals of monolithic IC technology, Basic Planar Processes, Realization of monolithic ICs and packaging. Fabrication of diodes,capacitor, resistor, transistor and FETs.

UNIT II CHARACTERISTICS OF OP AMP 9

OP-AMP -block diagram, Ideal OP-AMP characteristics, virtual ground concept, differential amplifiers, DC characteristics, AC characteristics; frequency response of OP-AMP circuits; summer, differentiator and integrator.

UNIT III APPLICATIONS OF OP AMP 9

Precision rectifier, half wave and full wave rectifiers, clippers, clampers, peak detectors, Instrumentation amplifier, V/I and I/V converters, S/H circuit, comparators, monostable and astable multivibrators, sine and triangular wave generators, first-and second-order active filters, log and antilog amplifier.

UNIT IV SPECIAL ICs 9

555 Timer Functional block diagram and description – Monostable and Astable operation, Applications, 566 Voltage Controlled Oscillator, 565 PLL Functional Block diagram – Principle of operation, Building blocks of PLL, Characteristics, Derivations of expressions for Lock and Capture ranges, Applications of PLL: Frequency synthesis, AM and FM detection, FSK demodulator.

UNIT V APPLICATION ICs 9

IC voltage regulators – 78xx, 79xx, LM317, 723 regulators, switching regulator: SMPS,78S40. LM 380 power amplifier, 8038 function generator IC, isolation amplifiers, opto- coupler – applications.

TOTAL:45 PERIODS

COURSE OUTCOMES

The student will be/have

CO1 Obtained the knowledge of ICs and their applications

CO2 Ability to fabricate and design the circuits using ICs.

CO3 Able to analyze and describe the characteristics of Op amps.

CO4 Learnt about Timers, PLL circuits and regulator Circuits

CO5 Able to analyze different application ICs.

TEXT BOOKS

1. RamakantA.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, PearsonEducation, 2003/ PHI. (2000)
2. D.RoyChoudhary, Sheil B.Jain, 'Linear Integrated Circuits', II edition, New Age, 2003

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

REFERENCE BOOKS

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997.
4. Sedra and Smith, "Microelectronic Circuits", Oxford University Press, Fifth Edition,2004.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2		2						2				1		
CO2	2		2						2				1		
CO3	2		2						2				2	2	1
CO4	3	2	2						2				2	2	1
CO5			3		2				3				3	1	

318EET05 Measurements and Instrumentation

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To make the student have a clear knowledge of Functional elements of an instrument, error, calibration etc.
- Emphasis is laid on analog and digital techniques used to measure voltage, current, energy and power etc.
- To have an adequate knowledge of comparison methods of measurement.
- To have elaborate discussion about storage & display devices
- Exposure to various transducers and data acquisition systems.

UNIT I INTRODUCTION **9**

Functions of instruments-Functional elements of an instrument – Performance characteristics of instruments -Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

UNIT II ELECTRICAL AND ELECTRONICS INSTRUMENTS **9**

PMMC instruments-MI instruments-Digital voltmeters – Single and three phase wattmeter's and Energy meters – Magnetic measurements – Determination of B-H curve and Measurements of iron loss– Instrument transformers – Instruments for measurement of frequency.

UNIT III COMPARISON METHODS OF MEASUREMENTS **9**

Types of D.C potentiometers: Laboratory type, Duo-range, Vernier and Deflection-Types of A.C potentiometers: Polar, co-ordinate Potentiometers-Types of D.C bridges: Wheatstone Bridge-Kelvin Bridge- Types of A.C bridges: Maxwell, Schering and Anderson Bridge-Transformer ratio bridges–

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Electromagnetic interference.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Recorders: Analog and Digital recorders: Magnetic tape Recorders-X-Y recorder- Digital plotters – Printers- CRT display-Digital CRO- LED& LCD - Dot matrix display – Data Loggers.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Requirements of a transducer- Classification of transducers – Selection of transducers – Resistive, inductive &capacitive transducers – Piezoelectric transducers-– Elements of Data Acquisitions system–Types of A/D converters, Types of D/A converters – Smart sensors.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1 Be able to analyze the performance characteristics and calibration of aninstrumentation system

CO2 Understand the operation of various types of Potentiometers and bridges.

CO3 Select and apply analog and digital techniques to measure voltage, current, energy,power etc.

CO4 Elaborate knowledge about storage and display devices.

CO5 Explain about various transducers and data acquisition systems.

TEXT BOOKS

1. E.O. Doebelin, 'Measurement Systems – Application and Design', Tata McGraw Hill publishingcompany, 2003
2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2004.

REFERENCE BOOKS

1. A.J. Bouwens, 'Digital Instrumentation', Tata McGraw Hill, 1997
2. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2007.
3. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, II Edition 2004
4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.
5. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi,2003.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3					1									
CO2	3		1											1	
CO3	3				2	1						1	2		
CO4	3					1						1	2		1
CO5	3				2	1						1	2		

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

318EET06	Fundamentals of Data structures in'C'	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Familiarize the basic programming concepts in C.
- Solve real time problems using functions, structure and union.
- Impart the basic concepts of linear data structures.
- Solve problem using nonlinear data structures.
- Identity the various Sorting, Searching and hashing algorithms.

UNIT I C PROGRAMMING BASICS **9**

Structure of a C program - compilation and linking processes - Constants, Variables – DataTypes- Expressions using operators in C - Managing Input and Output operations - Decision Making and Branching - Looping statements. Arrays - Initialization - Declaration - One dimensional and Two-dimensional arrays. Strings - String operations - String Arrays.

UNIT II FUNCTIONS, POINTERS, STRUCTURES AND UNIONS **9**

Functions - Pass by value - Pass by reference - Recursion - Pointers - Initialization - Pointers arithmetic. Structures and unions - Structure within a structure - Union - Files- Operations on Files-Memory Management.

UNIT III LINEAR DATA STRUCTURES **9**

Abstract Data Types - Linked list Implementation of List- polynomial addition- Linked List Implementation of Stack- Balancing Symbols - Postfix Expressions - Infix to Postfix Conversion-Linked list Implementation of Queues- Circular Queue.

UNIT IV NON LINEAR DATA STRUCTURES **9**

Preliminaries -Binary Trees -Tree Traversals - Binary Search Tree -Operations on Binary Search Tree - Heaps - Binary Heaps - Operations of Heaps - Graph and its representations -Graph Traversals - Shortest Path Algorithm: Dijkstra's Algorithm- Minimum Spanning Tree:Prim's Algorithm – Kruskal's Algorithm**.**

UNIT V SEARCHING, SORTING AND HASHING **9**

Linear Search - Binary Search -Bubble Sort - Insertion Sort - Quick Sort - Merge Sort - Hash Functions - Separate Chaining -Open Addressing.

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO1 Summarize the basic concepts of C
CO2 Develop programs for real time application using functions, structures, union
CO3 Gain knowledge on operations of linear data structures
Co4 Develop applications using nonlinear data structures
CO5 Apply appropriate sorting, searching technique for given problem.

TEXT BOOKS

1. Ashok.N.Kamthane,- "Computer Programming" , Pearson Education,Second edition(India), 2012
2. Mark Allen Weiss, "Data Structures And Algorithm Analysis In C", Second Edition, Pearson Education,2002

REFERENCE BOOKS

1. PradipDey and Manas Ghosh, —Programming in C, Second Edition,Oxford University Press, 2011.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

2. E.Balagurusamy, - “Computing fundamentals and C Programming”, Tata McGraw-Hill Publishing Company Limited, 2008.
3. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C, Second Edition, University Press, 2008

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3	2													
CO2	2	3	3										3		
CO3	2	3	3										3	2	
CO4	2	3	3										3	2	1
CO5					3								2		2

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

318EEP07	Linear Integrated Circuits Laboratory	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To understand the basics of linear integrated circuits and available ICs
- To understand characteristics of operational amplifier
- To apply operational amplifiers in linear and nonlinear applications
- To acquire the basic knowledge of special function ICs

LIST OF EXPERIMENTS

1. Inverting and Non inverting amplifiers.
2. Design of Integrator using IC 741.
3. Design of Differentiator using IC 741
4. Astable Multivibrator using Op-amp.
5. Half wave Precision rectifier using Op-amp
6. Schmitt Trigger.
7. RC Phase shift oscillator using Op-amp.
8. Wien bridge oscillator using Op-amp.
9. Astable and Monostable multivibrators using 555 Timer.
10. Regulated DC power supply using LM317.
11. Design of Active low-pass and High-pass filters.
12. Study of Voltage Controlled Oscillator (VCO).

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will have:

CO1 Learnt about the characteristics of op-amp

CO2 Gained the knowledge to analyze basic applications using op-amps.

CO3 Acquired knowledge to design power supply and multivibrator circuits.

CO4 Obtained knowledge to design and construct waveform generators

CO5 Learnt to design filter circuits using op-amps and learnt about VCO

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3		3										3		
CO2	3	2										1	2	1	
CO3	2	2	2						2					2	1
CO4	3	2	1						2				2		
CO5	3											3	2	1	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

318EEP08	Measurements and Instrumentation Laboratory	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To train the students in the measurement of displacement, resistance, inductance and capacitance
- To give exposure to A/D and D/A converters.
- To Calibrate single-phase energy meter
- To measure the three phase power and power factor

LIST OF EXPERIMENTS

1. AC bridges - Measurement of inductance,(Maxwell Bridge , Anderson bridge)
2. AC bridges - Measurement of capacitance(Schering bridge)
3. DC bridges - Wheatstone bridge, Kelvin double bridge.
4. A/D and D/A converters
5. Instrumentation amplifiers
6. Characteristics of LVDT
7. Calibration of single-phase energy meter
8. Calibration of current transformer
9. Measurement of three phase power and power factor
10. Measurement of iron loss
11. Characteristic of pressure transducers
12. Characteristic of LDR

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will have:

CO1 Learnt about the working of AC and DC bridges

CO2 Gained the knowledge to analyze A/D and D/A converters.

CO3 Acquired knowledge to calibration of single-phase energy meter andtransformer

CO4 Obtained knowledge to Measurement of three phase power and powerfactor

CO5 Learnt about Characteristic of pressure transducers and LDR

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1															
CO2			3		2				2				2		
CO3			2						2	3	1		2	1	
CO4					1	2			2				3		2
CO5			2		2				2						

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

318EEP09	Fundamentals of Data Structures in C Laboratory	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- Understand and implement basic data structures using C
- Apply linear and non-linear data structures in problem solving
- Learn to implement functions and recursive functions by means of data structures
- Implement searching and sorting algorithms.

LIST OF EXERCISES

1. Basic C Programs – Looping, Decision- Making
2. Programming using Arrays and String functions
3. Programming using Functions and Recursion
4. Programs using Structures and Union
5. Program using Pointers
6. Program using Memory Management Functions
7. Linked list implementation of List ,Stacks and Queues
8. Implementation of Tree Traversals
9. Implementation of Binary Search trees
10. Implementation of Graph Traversals
11. Implementation of Shortest Path Algorithm
12. Implementation of Linear search and binary search
13. Implementation of Insertion sort, Quick sort and Merge Sort

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon completion of the course, students will be able to:

CO1 Implement basic and advanced programs in C
CO2 Implement functions and recursive functions in C
CO3 Apply the different Linear Data Structures for Implementing Solutions to PracticalProblems.
CO4 Apply and implement Graph Data Structures for Real Time Applications.
CO5 Implement various Searching, Sorting and hashing Algorithms.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												2	1	
CO2	3	2	1				1		2			2	2		2
CO3	3	2	1				3		2			3	3	2	1
CO4	2	1							2						
CO5	2												2	1	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Semester IV

		L	T	P	C
418NMT01	**Numerical Methods**	**3**	**1**	**0**	**4**

COURSE OBJECTIVES

- To solve equations using direct and iterative methods.
- To introduce interpolation techniques to determine the intermediate values of a function from a given set of values in ordered pairs.
- To study the principle of numerical differentiation and integration using interpolation.
- To learn some of the methods of numerical solutions of ordinary differential equations with initial conditions.
- To determine the solutions of boundary value problems using numerical iterative processes

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton-Raphson method- Solution of linear system of equations - Gauss Elimination method - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Eigenvalues of a matrix by Power method.

UNIT II INTERPOLATION AND APPROXIMATION 9+3

Interpolation with equal intervals - Newton's forward and backward difference formulae - Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation.

UNIT III NUMERICAL DIFFERENTATION AND INTEGRATION 9+3

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3

Single step-methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi-step methods - Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3

Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL:45+15 = 60 PERIODS

COURSE OUTCOMES

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

CO1 Apply numerical methods such as direct and iterative methods to solve algebraic or transcendental equations and system of equations.

CO2 Use the concept of interpolation and apply to real life situations.

CO3 Appreciate numerical solutions for differential and integral calculus as a handy tool to solve problems.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO4 Implement numerical algorithms to find solutions for intial value problems for ordinary differential equations.

CO5 Demonstrate algorithms using finite differences to obtain solutions to boundary value problems.

TEXT BOOKS

1. Kandasamy.P, Thilagavathy,K. & Gunavathi.K., "Numerical Methods"., S.Chand & Company Ltd., New Delhi, 2014.
2. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2012.

REFERENCE BOOKS

1. Richard L.Burden and J.Dougles Faires, "Numerical Analysis", Ninth Edition, BROOKS/COLE, Visit: www.Cengage.com.,2012, visit www.cengage.com/international.
2. S.S.Sastry, "Introductory Methods of Numerical Analysis", 5th Edition, Prentice Hall of India Private Ltd., New Delhi, 2012.
3. Sankara Rao, K. "Numerical methods for Scientists and Engineers', 2nd Edition Prentice Hall of India Private Ltd., New Delhi, 2005.
4. Ward Cheney and David Kincaid, "Numerical Mathematics and Computing", Brooks/Cole Publishing company, Fourth Edition, 1999.
5. Jain M K, Iyengar S R K and Jain R K, "Numerical methods for Scientific and Engineering Computation", 6th edition, New Age International (P) Ltd, 2012.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1							2	2	2	
CO2	3	3	2	2	1							2	2	2	
CO3	3	3	3	2	2							2	2	2	
CO4	3	2	1	1	1							2	2	2	
CO5	3	2	2	2	2							2	2	2	

418EET02 **Control Systems** **L T P C**

3 0 0 3

Prerequisite: Electric Circuits, Engineering Mathematics-III

COURSE OBJECTIVES

- To make the student to understand the methods of obtaining the open-loop andclosed–loop systems.
- To make them understand the methods of representation of systems and to derivetheir transfer function.
- To make them gain knowledge in the time-domain and frequency domain response of systems
- To make them analyze the stability of the systems
- To make them analyze the system in state space representation.

UNIT I CONTROL SYSTEM MODELING **9**

Basic Elements of Control System - Open loop and Closed loop systems – Differential

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

equation - Transfer function, Modeling of Electric systems, Translational and rotationalmechanical systems - Block diagram reduction Techniques - Signal flow graph.

UNIT II TIME RESPONSE ANALYSIS 9

Time response analysis – Test Signals - First Order Systems - Impulse and Step Response analysis of second order systems – Time Domain Specifications-Steady state errors - P, PI, PD and PID Compensation, Analysis using MATLAB.

UNIT III FREQUENCY RESPONSE ANALYSIS 9

Frequency Response- Frequency Domain specifications -Bode Plot, Polar Plot, Nyquist Plot-Constant M and N Circles - Nichol's Chart - Use of Nichol's Chart in Control System Analysis.Lead, Lag, and Lead Lag Compensators, Analysis using MATLAB.

UNIT IV STABILITY ANALYSIS 9

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion -Relative Stability- Analysis using MATLAB.

UNIT V STATE VARIABLE ANALYSIS 9

State space representation of Continuous Time systems - Transfer function from State Variable Representation - Solutions of the state equations - Concepts of Controllability and Observability.

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

CO1 Ability to Understand the basic concepts of open-loop and closed–loop of systems.

CO2 Ability to understand the basic concept of systems and to derive their transferfunction models.

CO3 Analyzing the time-domain and frequency response of systems and steady state error analysis

CO4 Ability to analyze the concept of stability of control systems and designcompensator.

CO5 Ability to analyze the system in state space representation.

TEXT BOOKS

1. Nagrath I J and Gopal M, "Control System Engineering ", New Age InternationalPvt Ltd, Sixth Edition, 2017.
2. Ogata K, "Modern Control Engineering", Prentice-Hall of India Pvt Ltd., NewDelhi, 2010.

REFERENCE BOOKS

1. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, NewDelhi, 2007.
2. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004.
3. Benjamin C. Kuo, Automatic Control systems, Pearson Education, New Delhi,2003.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1	3	2											1		
CO2	3	2			2								1	2	
CO3	3	2	1		2								1	2	1
CO4	3	2	1										3	2	1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

CO5	2	2			1				3			2	2		

418EET03 **Digital Electronic Circuits** **L T P C**

3 0 0 3

Prerequisite: Basic Knowledge in Electron Devices

COURSE OBJECTIVES

- To study various number systems and to simplify the mathematical
- To study the implementation of combinational circuits
- To study the design and analysis of various synchronous sequential circuits.
- To study the design and analysis of various asynchronous sequential circuits.
- To expose the students to various memory devices.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Review of number systems; types and conversion, Codes- BCD, Gray, EX-3code, Error detection and correction codes, Code conversion, Logic Gates, Boolean algebra – Basic Postulates and theorems, switching functions, Canonical forms and simplification using K-maps and Quine McCluskey method.

UNIT II COMBINATIONAL CIRCUITS 9

Implementing Combinational Logic - Design of half adder and full adder, half and full- subtractor, magnitude comparators, code converters- Gray, EX-3codes, encoders, decoders,multiplexers and Demultiplexer. Function realization using gates and multiplexers.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Basic Concepts, Flip-Flops, Analysis of RS, JK, Master Slaves, T and D Flip-Flop, Registersand their applications, Synchronous and asynchronous counters, Up/Down counters, Ring counter. Analysis of synchronous sequential circuits; design of synchronous sequential circuits – Completely and incompletely specified sequential circuits - state diagrams, state assignment, state reduction.

UNIT IV ASYNCHRONOUS SEQUENCTIAL CIRCUITS 9

Mealy and Moore models, analysis procedure - circuit with latches - design procedure reductionof state and flow tables- race free state assignment- Hazards - Design problems.

UNIT V MEMORY DEVICES, PROGRAMMABLE LOGIC DEVICES 9

Memories: Read only memories, PROMs, EPROMs, EEPROMs, and RAMs: Static RAM,Dynamic RAM, Magnetic memories, CD-ROM, Flash memories. Introduction to Programmable Logic Devices: PLA, PAL, CPLD, EPLD, FPGA.

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be

CO1 Gained the knowledge of fundamental concept of various number systems

CO2 Able to Implement simple combinational logic circuits using logic gates.

CO3 Able to design of various synchronous sequential circuits.

CO4 Able to design of various asynchronous sequential circuits.

CO5 Understood about semiconductor memories, PLDs.

TEXT BOOKS

1. M. Morris Mano, 'Digital Design', Pearson Education, 2013.
2. Raj Kamal, ' Digital systems-Principles and Design', Pearson education 2nd edition, 2007
3. Comer "Digital Logic & State Machine Design, Oxford, 2012.
4. James W. Bignel, Digital Electronics, Cengage learning, 5th Edition, 2007.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

REFERENCE BOOKS

1. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.
2. Thomas L.Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015.
3. Mandal, "Digital Electronics Principles & Application, McGraw Hill Edu, 2013.
4. D.P.Kothari, J.S.Dhillon, 'Digital circuits and Design', Pearson Education, 2016.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3												2		
CO2	1	3	3										3		2
CO3		3	3										3		1
CO4			1										2		
CO5		2	2		2				3				3	1	

418EET04 **Power Generation Systems** **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To learn about the generation of electric power by steam and gas powerstations.
- To understand the generation of electric power by hydro power station.
- To understand the generation of electric power by nuclear and diesel power stations.
- To understand the various types of wind energy conversion systems.
- To study the generation of electric power from solar energy using solarPhotovoltaic systems.

UNIT I STEAM AND GAS POWER PLANT 9

Generation of electric power from Conventional and non-conventional sources of energy.
Steam Power Station: Schematic arrangement, advantages and disadvantages, choice of site selection, Types of prime movers, Environmental aspects.
Gas Turbine Power Plant: Schematic arrangement, advantages and disadvantages of Gas turbine power plant. Open cycle and Closed cycle gas turbine power plant, Combined cycle power plant.

UNIT II HYDRO POWER STATION 9

Schematic arrangement, advantages and disadvantages, choice of site constituents of hydro power plant, Hydro turbine. Types of hydro power station- pumped storage plant-Environmental aspects for selecting the sites and locations of hydro power stations.

UNIT III NUCLEAR AND DIESEL POWER STATION 9

Nuclear power station: Schematic arrangement, advantages and disadvantages, selection of site, types of reactors, Hazards, Environmental aspects for selecting the sites and locations of nuclear power stations.
Diesel power station: Introduction, Schematic arrangement, advantages and disadvantages, Choice

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

and characteristics of diesel engines.

UNIT IV WIND ENERGY 9

Introduction-Basic principles of wind energy conversion-site selection considerations-basic components of Wind Energy Conversion System-Classification of WECS-Horizontal and vertical axial machines -Advantages and disadvantages of WECS- Grid connection.

UNIT V SOLAR ENERGY 9

Solar constant-solar radiation measurements-solar radiation Data-Solar energy collectors-Flat-plate collectors and concentrating collector-Solar energy storage-Solar Pond-Solar Electric Power Generation: Solar Photo-Voltaic Systems -Applications of Solar Photovoltaic systems- Solar Pumping-Grid connection. Storage systems-Battery, super capacitor.

TOTAL:45 PERIODS

COURSE OUTCOMES

The student will be/have

CO1 Understanding the layout, construction and working of steam and gas power plants

CO2 Understanding the layout, construction and working of hydro power station and identify the appropriate site for it.

CO3 Understanding the layout, construction and working of Nuclear and Diesel power station.

CO4 Understanding the layout, construction and working of Wind Energy Conversion systemand its applications.

CO5 Analyzing the solar energy system, radiation measurements and applications.

TEXT BOOKS

1. Renewable Energy Technologies, Solanki, Chetan S. , PHI Learning, New Delhi, 2011
2. Non-Conventional Energy Sources, G.D. Rai , Khanna Publishers, New Delhi, 2011.
3. Solar Energy, S.P.Sukhatme and J.K Nayak, McGraw Hill education, Fourth Edition, 2017.
4. Wind Power Technology, Earnest, Joshua, PHI Learning, New Delhi, 2013.

REFERENCE BOOKS

1. Electrical Power, Dr. S.L. Uppal, Khanna Publishers, 13th Edition 2009
2. Renewable Energy Sources for Sustainable Development, N.S. Rathore and N. L. Panwar,New India Publishing Agency, New Delhi,2007.
3. Wind Power in Power System, Thomas Ackermann, John Willey &Sons, 2005
4. Electric Power Generation: Transmission and Distribution, S. N. Singh, PHI Learning,2008.
5. A Text book of Power System Engineering, A Chakrabarti, M. L Soni, P. V. Gupta, U. S.Bhatnagar, Dhanpat Rai Publication.2009.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	3	2											2		
CO3		3	3	2	2				2		2	2	2	3	2

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO4			3	3	3				3		2	2	2	2	1
CO5	3		2		2						2		2		

418EET05 **Electrical Machines-I** **L T P C**

3 0 0 3

Prerequisite: Basic knowledge in Electromagnetic Theory is required

COURSE OBJECTIVES

- To introduce the concept of rotating machines and the principle of electromechanical energy conversion in single and multiple excited systems.
- To understand the working principle of generation of D.C. voltages by usingdifferent types of generators.
- To study the working principles of D.C. motors and their load characteristics,starting and methods of speed control. and study their performance
- To study the testing and methods of speed control of D.C. motors.
- To study the working principles of transformers, autotransformer and thedifferent testing methods to estimate their performance.

UNIT I ENERGY CONVERSIONS AND ROTATING MACHINES 9

Principle of energy conversion-Energy in magnetic systems-singly excited system: Electrical input energy, magnetic field energy stored and co-energy - Multiply excited system - Generated EMF - MMF of distributed windings: MMF space wave of single coil– magnetic fieldsin rotating machines-Problems.

UNIT II DC GENERATORS 9

Constructional details- Principle of operation - EMF equation- Methods of Excitation – Types of DC Generators: Separate, shunt, series and compound - Armature reaction - Commutation - Interpoles- Compensating windings- losses -Applications -Problems.

UNIT III DC MOTORS 9

Principle of operation – Torque equation- Lenz's law-Back EMF- Types of DC Motors: shunt, series and compound - Electrical and Mechanical characteristics of DC shunt series and compound motors - Starters: need for starters, two point, three point and four point. Losses and efficiency - Applications- Problems.

UNIT IV TESTING AND SPEED CONTROL OF DC MACHINES 9

Testing: O.C.C. and load test on separately and self-excited DC Generators - Brake test –Swinburne's test –Hopkinson's test on motor - advantages and disadvantages – Applications - Numerical problems. Speed control: Armature and field control on Shunt motor - Ward- Leonard control system - advantages and disadvantages.

UNIT V TRANSFORMERS 9

Constructional details - Principle of operation - Classification of Transformers-Ideal transformers - EMF equation - Transformation ratio - Equivalent circuit - Voltage regulation - Losses and Efficiency - All day efficiency -– Open circuit and short circuit tests - Sumpner's test- Separation of no load losses - Problems. Auto-Transformer - Principle of operation - Applications.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon Completion of this course, students will be able to:

CO1 Able to understand the basic concepts of rotating machines.

CO2 Learn the working principles and characteristics of DC Generators and motors.

CO3 Analyze the performance characteristics of Rotating Machines.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO4 Gain the knowledge in testing and speed control on DC machines.

CO5 Learn the working principles, performance of transformer and autotransformer.

TEXT BOOKS

1. Nagrath I. J and Kothari D. P. 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, Fifth edition , 2017.
2. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 7th Edition, 2011
3. B.L. Theraja, 'A text book of Electrical Technology', Volume II , S. Chand Limited, 2017 .

REFERENCE BOOKS

1. Fitzgerald.A.E. Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', 2017.
2. P. C. Sen., 'Principles of Electrical Machines and Power Electronics', JohnWiley&Sons, 2013
3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2010.
4. Cotton H, "Advanced Electrical Technology", A H Wheeler and CompanyPublications, London, 2011.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2					2									
CO2	3														
CO3	2												1		
CO4	2				2								1		
CO5	2	2				2									

418EEP07	Electrical Machines-I Laboratory	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To study the various characteristics of DC machines and transformer experimentally.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of a separately excited DC Generator.
2. Open circuit and load characteristics of self-excited DC shunt generator.
3. Load characteristics of DC compound generator with differential and cumulative connection.
4. Load characteristics of DC shunt motor
5. Load characteristics of DC series motor.
6. Load characteristics of DC compound motor
7. Speed control of DC shunt motor.
8. Swinburne's test on DC shunt motor.
9. Hopkinson's test on DC motor – generator set.
10. Load test on single-phase transformer.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

11. Open circuit and short circuit tests on single phase transformer
12. Separation of no-load losses in single phase transformer

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will have:

CO1 Analyzed the characteristics of DC generators.
CO2 Tested the DC motors.
CO3 Ability to analyze speed and efficiency of DC machines.
CO4 Understood the various tests on transformers.
CO5 Ability to understand the various losses of transformers.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2		2											1
CO2	3	2	2	2											
CO3	3	2		2										2	
CO4	3	2	2	1											
CO5	3	2			3				1				2		

418EEP08 **Electrical and Electronics Simulation Laboratory** **L T P C**
0 0 2 1

COURSE OBJECTIVES

- Gain knowledge on characteristics of Electrical and Electronics simulation

LIST OF EXPERIMENTS

1. Introduction to MATLAB
2. Diode characteristics
3. MOSFET characteristics
4. SCR characteristics
5. Single phase Half wave rectifier with R load
6. Single phase Half wave rectifier with RL load
7. Single phase full wave rectifier with R load
8. Single phase full wave rectifier with RL load
9. IGBT characteristics.
10. Basic operations of matrices using MATLAB
11. Pspice simulation of DC circuits
12. Pspice simulation of AC circuits

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will have:

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO1 Analyzed the characteristics of diode.
CO2 Analyzed and verified different Rectifiers.
CO3 Demonstrated the operation of Single phase half wave and full wave rectifiers
CO4 Understood basic operations of Matrices.
CO5 Analyzed the characteristics of DC and AC circuits using Pspice.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	2											1		
CO2	1		2										2		1
CO3	1	2	2										1		
CO4	2	1	2										1		
CO5	2		3		2				1				2	2	1

418EEP09 Control Systems Laboratory

L	T	P	C
0	0	2	1

COURSE OBJECTIVES

- To impart knowledge on transfer function of various machines, stability analysis, digital simulation of first order and second order systems and stepper motor control.

LIST OF EXERCISES

1. Transfer function of separately excited DC Generator.
2. Transfer function of self-excited DC Generator
3. Transfer function of Armature controlled DC Motor.
4. Transfer function of Field controlled DC Motor.
5. Transfer function of AC Servomotor.
6. DC and AC position control systems.
7. Simulation of first order system using MATLAB.
8. Simulation of second order system using MATLAB.
9. P, PI and PID Controllers (First Order).
10. Design of Lag network.
11. Design of Lead network.
12. Design of Lag-Lead network.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon completion of the course, students will be able to:

CO1 Analyze the Transfer function of separately excited DC generators.
CO2 Analyze Transfer function of self-excited DC generators.
CO3 Analyze speed control of DC motor.
CO4 Understand the various position control systems
CO5 Learn about the various controllers and networks.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1		2	1												
CO2	2									1					
CO3		2	1							1					
CO4		2													
CO5	3	2	1							1					

PROFESSIONAL ELECTIVE -III

418EEE06	Bio Medical Instrumentation	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To provide an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Methods of different transducers used.
- To introduce the student to the various sensing and measurement devices ofelectrical origin.
- To provide the latest ideas on devices of non-electrical devices.
- To bring out the important and modern methods of imaging techniques.
- To provide latest knowledge of medical assistance / techniques andtherapeutic equipment.

UNIT I BIO-POTENTIAL ELECTRODES AND RECORDERS 9

Introduction- Design of Medical Instruments-Components of the bio-medical instrument system-Bio-potential Micro electrodes- Recording set up and Analysis: ECG, EEG, EMG and ERG-Recorders with high accuracy- recording devices.

UNIT II BIO-MEDICAL INSTRUMENTATION 9

Introduction - Blood cell counter- Radiation Detectors - colorimeter and photometer- Digital thermometer – X-Ray machine - Audio meter - Radiography and fluoroscopy – Image intensifier– Angiography – Applications of X-Ray examination.

UNIT III PHYSIOLOGICAL ASSIST DEVICES 9

Introduction – Pacemaker –Pacemaker batteries – Artificial heart valves - DC Defibrillators Nerves and muscle stimulator -Heart lung machine, Artificial heart valves and kidney machine.

UNIT IV SPECIALISED MEDICAL EQUIPEMENT 9

Introduction – Electromagnetic blood flow meter- Ultrasonic blood flow meters – laser based Doppler blood flow meters – Cardiac output measurements – pulmonary function Analysers-Oxymeters.

UNIT V ADVANCES IN BIO-MEDICAL INSTRUMENTATION 9

Computer in medicine- Laser in medicine – Endoscopes – Thermograph - cryogenic surgery –Basic ideas: CT scanner, MRI and ultra-scanner, Ultrasonic imaging system – Biofeedback Instrumentation.

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able to:

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO1 Identify the physiological parameters of various systems of humanbody.
CO2 Recognize the transducers used for the measurement of physiologicalparameters.
CO3 Design the different types of lead systems to record the waveforms.
CO4 Demonstrate the usage of assisting and therapeutic equipment
CO5 Understand the latest imaging equipment

TEXT BOOKS

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 1997.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley andsons, New York, 1998.

REFERENCE BOOKS

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi,1997**.**
2. Joseph J.carr and John M. Brown, "Introduction to Biomedical equipment technology",John Wiley and sons, New York, 1997.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1		2	2								2		
CO2			2	2	2									2	1
CO3			2	3	2									2	1
CO4	3	2	1		3								1		
CO5			2	2	3									2	1

418EEE07 Neural Networks and Fuzzy Systems

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To conceptualize the working of human brain using ANN.
- To become familiar with neural networks that can learn from available examples and generalizeto form appropriate rules for inference systems.
- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on humanexperience.
- To provide the mathematical background for carrying out the optimization and familiarizingvarious algorithm for seeking global optimum in self-learning situation.
- To provide the ideas of neuro-fuzzy controller systems.

UNIT I INTRODUCTION TO NEURAL NETWORKS 9

Introduction to Neural Networks, Biological Neural Networks, Comparison between Neural networks and Biological Neural Networks-Fundamental concepts, weights, biases and thresholds-Linear capability-Common activation functions, Learning rules and Learning methods of NN- Supervised Learning algorithms, Un-Supervised Learning algorithms, Single Layer, Multilayer Feed forward network- Recurrent network.

UNIT II NEURAL NETWORKS ARCHITECTURES AND ALGORITHMS 9

Mcculloh Pitts neuron-Hebbnet-Perceptron-Adaline-Hopfield net-Maxnet-Mexican Hat-

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Hamming net-Kohonen self-organizing map-Adaptive resonance theory-Back propagation neural network.

UNIT III FUZZY SETS AND RELATIONS 9

Crisp set-vagueness – uncertainty and imprecision – fuzzy set-fuzzy operators – properties – crisp versus fuzzy sets-representation of fuzzy sets-Membership functions, fuzzy complements, union, interaction combination of operators, crisp and fuzzy relations – compositions of fuzzy relations

UNIT IV CONCEPTS OF FUZZY LOGIC 9

Fuzzy Systems- Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods –Fuzzy Structure ofFuzzy logic controllers- Comparison of Fuzzy and Neural Systems.

UNIT V APPLICATIONS OF NEURAL NETWORKS AND FUZZY SYSTEMS 9

Cognitron and Neocognitron Architecture-Training Algorithm and application-Fuzzy associative memories-fuzzy and neural function estimators- Fuzzy associative memories system Architecture--Adaptive neuro, Adaptive Fuzzy, Adaptive Neuro-Fuzzy interface systems-Neuro Controller, Fuzzy logicController.

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will have :

CO1 Ability to understand the difference between biological neuron and neural networks

CO2 Ability to understand the difference between learning and programming and explore practical applications of Neural Networks (NN).

CO3 Ability to appreciate the importance of optimizations and its use incomputer engineering fields and other domains.

CO4 Ability to analyze and appreciate the applications which can use fuzzylogic.

CO5 understood the efficiency of a hybrid system and how NeuralNetwork and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications.

TEXT BOOKS

1. Introduction to Neural Networks using MATLAB 6.0 – S.N.Sivanandam, S.Sumathi,S.N.Deepa,TMH, 2006.
2. Timothy J.Ross “Fuzzy Logic With Engineering Applications” Wiley, 2011.
3. Laurene Fausett, “Fundamentals of Neural Networks: Architecture, Algorithms andApplications”, Pearson Education, 2004.

REFERENCE BOOKS

1. Satish Kumar “Neural Networks A Classroom Approach” Tata McGrawHill,2017.
2. S.Rajasekaran and G.A.Vijayalakshmi Pai “Neural Networks, Fuzzy Logic and GeneticAlgorithms”PHILearning,2003.
3. Zimmermann H.S “Fuzzy Set Theory and its Applications” Kluwer Academic Publishers,2011.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1		2	2		2						2		2		
CO2					2						2		2		
CO3			2		2						2			2	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO4											3				1
CO5		2	2								3			2	

418EEE08 **Electrical Engineering Materials** **L T P C**

3 0 0 3

COURSE OBJECTIVES

To Study about

- Metallic conduction of various materials
- Semiconductor magnetic materials
- Insulation materials and dielectrics
- Piezo electric materials
- Applications of materials.

UNIT I CONDUCTING MATERIALS 9

Review of metallic conduction on the basis of free electron theory. Fermi-Dirac distribution – variation of conductivity with temperature and composition, materials for electric resistors- general electric properties; material for brushes of electrical machines, lamp filaments, fuses and solder.

UNIT II SEMICONDUCTORS MAGNETIC MATERIALS 9

Semiconductors: Mechanism of conduction in semiconductors, density of carriers in intrinsic semiconductors, the energy gap, types of semiconductors. Hall effect, compound semiconductors, basic ideas of amorphous and organic semiconductors. Magnetic materials: Classification of magnetic materials- origin of permanent magnetic dipoles, ferromagnetism, hard and soft magnetic materials, magneto materials used in electrical machines, instruments and relays.

UNIT III DIELECTRICS INSULATING MATERIALS 9

Dielectrics: Dielectric, polarization under static fields- electronic ionic and dipolar polarizations, behavior of dielectrics in alternating fields, Factors influencing dielectric strength and capacitor materials. Insulating materials, complex dielectric constant, dipolar relaxation and dielectric loss. Insulating materials: Inorganic materials mica, glass, porcelain, asbestos, organic materials paper, rubber, cotton silk fiber, wood, plastics and Bakelite-, resins and varnishes, liquid insulators-transformer oil. gaseous insulators air, SF6 and nitrogen and ageing of insulators.

UNIT IV PIEZOELECTRIC MATERIALS 9

Introduction Properties and Application of Piezoelectric materials, Eletrostrictive materials, Ferromagnetic materials, Magneto strictive materials. Ceramics: properties, application to conductors. Plastics: Thermoplastics, rubber, thermostats, properties.

UNIT V MATERIALS FOR SPECIAL APPLICATIONS 9

Materials for solar cells, fuel cells and battery. Materials for coatings for enhanced solar thermal energy collection and solar selective coatings, Cold mirror coatings, heat mirror coatings, antireflection coatings, sintered alloys for breaker and switch contacts.

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO1 Understand electrical materials.

CO2 Understand about insulating.

CO3 Understand dielectrics and insulating materials

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Co4 Understand Piezoelectric materials

CO5 Learn the Applications of Electrical materials

TEXT BOOKS

1. C.S.Indulkar and S. Thiruvengadam, S., "An Introduction to Electrical Engineering.2014
2. Kenneth G. Budinski,, "Engineering Materials: Prentice Hall of India, New Delhi.2009
3. Electrical Engineering materials by E.R.Rajput laxmi publications.2010

REFERENCE BOOKS

1. Electrical Engineering Materials by Sahdev, Unique International Publications.2008
2. Electronic Engineering Materials by ML Gupta, Dhanpat Rai & Sons, New Delhi.2015
3. Electrical & Electronics Engineering Materials BR Sharma and Others, Satya Parkashan,New Delhi.2011.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2														
CO2	2	1													
CO3	2		2										2	2	
CO4	2	1	1										2	2	1
CO5	1	2											2		

418EEE09 Fundamentals of Nano Science

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To study the basics of nano science
- To study the various methods preparation
- To study the basics about nano materials
- To study the different characterization techniques
- To understand the applications of nano science in different fields

UNIT I INTRODUCTION **9**

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering Classifications of nanostructured materials- nano particles- quantum dots, nanowires- ultra-thin films multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION **9**

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering,

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS 9

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationshipsapplications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays functionalization and applications-Quantum wires, Quantum dots- preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES 9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysistechniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nan indentation.

UNIT V APPLICATIONS 9

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be :

CO1 Familiarized about the nanoscience
CO2 Able to demonstrate the preparation of nonmaterial
CO3 Learnt about nano materials
CO4 Having developed knowledge in characteristic nonmaterial
CO5 Learnt the applications of Nano materials

TEXT BOOKS

1. A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties andApplications”, Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, “Nanoscale Charecterisation of surfaces & Interfaces”, 2nd edition,Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCE BOOKS

1. G Timp, “Nanotechnology”, AIP press/Springer, 1999.
2. Akhilesh Lakhtakia,“The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations”. Prentice-Hall of India (P) Ltd, New Delhi, 2007.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		2			2	1							2	
CO2	3	2		2		1									
CO3		3		2										2	1
CO4	2	2		3		2								2	1
CO5	2	2		2		2								3	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Semester V

		L	T	P	C
518EET01	**MICROPROCESSORS AND MICROCONTROLLERS**	**3**	**0**	**0**	**3**

PREREQUISITE : Digital Logic Circuits and Linear Integrated Circuits and Applications

COURSE OBJECTIVES

- To summarize the architecture and assembly language programming of microprocessors.
- To interpret the architecture and assembly language programming of microcontrollers
- To Demonstrate the concept of interrupts and interfacing with variousperipherals.
- To Integrate the features of 8051 microcontroller and its timer applications.
- To get exposed to features of PIC Microcontroller.

UNIT I 8085 AND 8086 MICROPROCESSORS 9

Evolution of Microprocessors – Introduction to 8085 – Architecture – Addressing Modes –Timing diagrams – Instruction set – Assembly language programming- Introduction to 8086 – Architecture- Assembly language Programming.

UNIT II PERIPHERAL ICs INTERFACING 9

Programmable Peripheral Interface (8255) - keyboard display controller (8279) – ADC – DAC Interface – Programmable Timer Controller (8254) – Programmable interrupt controller (8259) – Serial Communication Interface (8251) – DMA Controller (8257).

UNIT III 8051 MICROCONTROLLER 9

8051 Microcontroller- Architecture - Instruction Set –Addressing modes –Interrupts – Assembly Language Programming - Programming 8051 Timer/Counter- Serial Port Programming – Interrupts Programming.

UNIT IV 8051 REAL WORLD INTERFACING AND SYSTEM DESIGN 9

8051 Interfacing-ADC,DAC interfacing-External Memory interfacing- Sensors Interfacing-Motor Control-Relay-PWM-DC motor and Stepper Motor-Design of traffic light control and Washing machine Control.

UNIT V INTRODUCTION TO PIC 9

PIC16F8XX Flash microcontrollers: Pin diagram of 16F8XX, Architectural features, I/O Ports, Timers, Interrupts, Memory organizations.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students should have the:

CO1 Recognize the basic microprocessor architecture and its concepts.

CO2 Outline the concepts of peripheral interfacing mechanisms.

CO3 Design various assembly language programming using microprocessors and microcontroller.

CO4 Extend the real world interfacing with microcontroller.

CO5 Extrapolate the architecture of PIC microcontroller.

TEXT BOOKS

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 6th Edition,Penram International Publishing, New Delhi, 2013.
2. Douglas V.Hall, Microprocessor and Interfacing, Programming and Hardware. Revised second Edition,Indian edition, 11th Reprint 2010, Tata McGraw Hill.
3. Mohammed Ali Mazidi and Janice GillispieMazidi, The 8051 Microcontroller and EmbeddedSystems,Pearson Education Asia, New Delhi, 2nd Edition 2003.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

4. Raj Kamal "Embedded Systems Architecture Programming and Design" 2nd Edition,TMH,2008.
5. John B.Peatman, Design with PIC Microcontrollers, Pearson Education Asia,6th Edition 2002.

REFERENCE BOOKS

1. A.K. Ray and K.M.Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGrawHill International Edition, 2nd Edition 2000
2. Kenneth J Ayala, The 8051 Microcontroller, 3rd Edition, Cengage Learning Publishers (India), 2007.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	3	2	2		2							2	2		
CO3		3	2	2										3	2
CO4			3	3	3				2		2	2	2	1	
CO5			3	3	3				2		2	2	2	1	

518EET02 **ELECTRICAL MACHINES II**

L	T	P	C
3	0	0	3

PREREQUISITE : Electrical Machines I

COURSE OBJECTIVES

- Construction and performance of salient and non-salient type synchronous generators.
- Principle of operation and performance of synchronous motor.
- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single-phase induction motors and special machines

UNIT I ALTERNATOR 9

Constructional details – Types of rotors – EMF equation – Synchronous reactance-Armature reaction – Voltage regulation – EMF, MMF– Synchronizing and condition of parallel operation – Synchronizing power – Change of excitation and mechanical input –Blondel's theory –Determination of Xd^- and Xq using slip test.

UNIT II SYNCHRONOUS MOTOR 9

Principle of operation – Torque equation – Starting methods –Operation on infinite bus bars – V and inverted V curves – Power input and power developed equations – Power/power angle relations – Hunting – synchronous condenser – Applications.

UNIT III THREE PHASE INDUCTION MOTOR 9

Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Torque equations –Slip-torque characteristics – Losses and efficiency – Load test – No loadand blocked rotor tests – Circle diagram – Separation of no load losses –Crawling and cogging – Induction generator.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 9

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Starters – Types of starters – Direct On Line, Stator resistance, rotor resistance, autotransformer and star-delta starters. Speed control: changes of voltage, frequency, poles and rotor resistance – Cascaded connection- Applications.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 9

Constructional details – Double revolving field theory – Starting methods and applications – Working principles of shaded pole induction motor, Linear Induction motors, repulsion motor, Hysteresis motor, Working principles of stepper motor , universal motor. Applications.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will have the ability to:

CO1 Illustrate the constructional details, principles of operation, performance of Alternators.

CO2 Develop and to calculate torque, starting methods of synchronous motor.

CO3 Demonstrate the constructional details, principles of operation, performance of three phase induction motor.

CO4 Correlate the different starting and speed control methods to three phase induction motors.

CO5 Interpret the knowledge basic concepts and principles of special machines.

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing CompanyLtd, New Delhi, 4th Edition, 2010.
2. Theraja B L., Theraja A K., "A Text Book of Electrical Technology Vol.II AC & DCMachines" S Chand and Company Limited, 23rd Revised Edition,2009.
3. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 14th Edition,2015
4. K.Murugesh Kumar, 'Induction & Synchronous Machines', Vikas Publishing House Pvt. Ltd,1st Edition, 2000.
5. Stephen J. Chapman, 'Electric Machinery Fundamentals'4th Edition, McGraw Hill EducationPvt. Ltd, 2010.

REFERENCE BOOKS

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGrawHill Publishing Company Ltd, 6th Edition, 2015.
2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 7th Edition, 2011.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	3	3	2		2							2		
CO2	2					2							2		
CO3	2						2							3	2
CO4	2					3							2	1	
CO5	2					3			2				2	1	

518EET03 ADVANCED CONTROL THEORY

L	T	P	C
3	1	0	4

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

PREREQUISITE : Control Systems

COURSE OBJECTIVES

- Description and stability of non-linear system.
- Conventional techniques of non-linear system.
- Analysis of discrete time systems using conventional techniques.
- Analyze the stability of non-linear systems using different techniques.
- Design of optimal controller.

UNIT I STATE VARIABLE DESIGN 12

Introduction to state variable- Design by state feedback-Output feedback-Pole placement technique-Design of state and output feedback controllers – Design of reduced and full order observers- PI feedback-Dynamic state feedback.

UNIT II SAMPLED DATA CONTROL SYSTEM 12

Introduction to Sample data control systems- Sampling process, signal reconstruction, difference equation, Z-transform, Z-transfer function – Inverse Z transform, Z- transform analysis of sampled data control system, Z and S domain Relationship.

UNIT III NON-LINEAR SYSTEMS 12

Types of non-linearity-Typical examples-Equivalent linearization- Phase plane analysis- Limit cycles-Describing functions-Analysis using Describing functions.

UNIT IV STABILITY ANALYSIS 12

Introduction-Equilibrium points- BIBO and asymptotic stability- Direct method of Liapunov-Application to non-linear problems- Frequency domain stability criteria- popov's method and its extensions.

UNIT V OPTIMAL CONTROL 12

Introduction-Decoupling-Time varying optimal control- LQR steady state optimal control- Optimal estimation – Multivariable control design.

TOTAL:60 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Identify state variables and poles to find the stability of non-linear systems.

CO2 Formulate differential equation, Z-transform, Z transfer function.

CO3 Analyze and functioning of non linear systems.

CO4 Demonstrate the stability analysis of non linear systems.

CO5 Analyze the optimal control theory to non linear systems.

TEXT BOOKS

1. "Modern Control Engineering" by K Ogata, prentice Hall, 5th Edition, 2010.
2. "Discrete Time Control Systems" by K Ogata, prentice Hall, 2nd Edition, 2015.
3. "Digital Control and State Variable Methods" by Madan Gopal, McGraw Hill Education, 3rd Edition,2010.

REFERENCE BOOKS

1. "Modern Control Engineering" by Roy Choudhury, PHI Learning Private Limited, 8th Edition, 2015.
2. "Advanced Control Systems Design" by Bernard Friedl, Prentice Hall, 3rd Edition, 2010.
3. "Advanced Control Systems" by B N Sarkar, , PHI Learning Private Limited, 7th Edition, 2015

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1	3												2		
CO2	3	2											2	1	
CO3	3	2											2	1	1
CO4	3	2											2	1	
CO5	3			1									2		

518EET04 **PROTECTION AND SWITCHGEAR** **L T P C**
3 0 0 3

PREREQUISITE : Electrical Machines

COURSE OBJECTIVES

- Nature and causes of faults, earthing, protection schemes, construction and characteristics of relays.
- Apparatus protection and instrument transformer.
- Arc interruption methods, RRRV, Resistance switching and current chopping.
- Function of circuit breakers, Rating and testing of circuit breakers.
- Causes of over voltages, methods of protection against over voltages and insulation coordination.

UNIT I PROTECTIVE RELAYS 9

Need for power system protection schemes – nature and causes of faults – types of faults – Power system earthing – Zones of protection and essential qualities of protection – Protection scheme – construction and characteristics of relays – over current relays – directional, distance and differential relays- under frequency relays – negative sequence relays – static relays – microprocessor based relays.

UNIT II APPARATUS PROTECTION 9

Apparatus protection – generator and transformer protection – protection of bus bars, transmission lines, CT's, PT's and their application in protective schemes.

UNIT III THEORY OF CIRCUIT INTERRUPTION 9

Physics of arc phenomena and arc interruption. Restriking voltage and Recovery voltage, rate of rise of recovery voltage, current chopping, interruption of capacitive current, resistance switching – DC circuit breaking.

UNIT IV CIRCUIT BREAKERS 9

Switch gear – fault clearing process – interruption of current – Types of Circuit Breakers – Air blast, oil, SF6 and Vacuum circuit breakers – comparative merits of different circuit breakers – MCBs – Testing of circuit breakers – Circuit breaker ratings.

UNIT V PROTECTION AGAINST OVER VOLTAGES 9

Causes of over voltages – methods of protection against over voltages – ground wires, Petersoncoil, surge absorbers, surge diverters – relay co-ordination – selection of protective system – Insulation co-ordination.

TOTAL: 45 PERIODS

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Recognize the cause of faults, earthing, protection schemes, construction and characteristics of relays.

CO2 Categorize the apparatus protection and instrument transformer.

CO3 Classify the arc interruption methods, estimate RRRV and resistance switching.

CO4 Demonstrate the function of circuit breakers, testing of circuit breakers and estimate the Rating of circuit breakers.

CO5 Identify the causes of over voltages, methods of protection against over voltages and insulation coordination.

TEXT BOOKS

1. Sunil S.Rao, Switchgear and Protection, Khanna publishers, New Delhi,13th Edition 4thReprint,2010.
2. Y.G.Paithankar and S.R.Bhide, 'Fundamentals of power system protection', 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi , 2010.
3. Badri ram and Vishwakarma D N,"Power System Protection and Switchgear" 2nd EditionTata McGraw Hill Publishing Company Ltd. New Delhi , 2011.

REFERENCE BOOKS

1. B.Rabindranath and N.Chander, 'Power System Protection and /Switchgear',New Age International (P) Ltd., 1stEdition 2011.
2. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, 'A Text Book on Power SystemEngineering', Dhanpat Rai & Co., 2nd Edition, 2017.
3. Ravindra P.Singh, " Switchgear and Power System Protection " PHI Learning Private Ltd., New Delhi , 2014.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2					2									
CO2	3														
CO3	2														
CO4	2				2								1		
CO5	2	2				2									

518EET05 **TRANSMISSION AND DISTRIBUTION**

L	T	P	C
3	0	0	3

PREREQUISITE : Nil

COURSE OBJECTIVES

- To study the description and structure of power systems.
- To study the conventional technique transmission line parameters.
- To study the performance of transmission lines.
- To study the different types of cables and insulators.
- To study the mechanical design of transmission line and distribution system.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT I INTRODUCTION 9

Structure of electric power systems – Types of transmission systems: AC systems – DC systems-Advantages and disadvantages of AC and DC System-EHV AC transmission systems: Necessity for EHV Transmission-Merits and Demerits of EHV Transmission system-HVDC Transmission: Principle-Types of HVDC System- Merits and Demerits of HVDC Transmission system- comparison of HVDC and HVAC systems – Terminal equipment of-HVDC Transmission line-FACTS (qualitative treatment only): TCSC, SVC, STATCOM, DVR ,UPFC.

UNIT II TRANSMISSION LINE PARAMETERS 9

Parameters of single and three phase transmission lines with single and double circuits: Resistance, inductance and capacitance– stranded and bundled conductors – symmetrical and unsymmetrical spacing – Transposition of conductors – self and mutual GMD – Skin and Proximity effect –Inductive interference with neighboring circuits.

UNIT III PERFORMANCE OF TRANSMISSION LINES 9

Classification of lines: Short line, medium line and long line; equivalent circuits, Attenuation constant, phase constant, surge impedance; Transmission Efficiency and Voltage Regulation-Active and Reactive power flow in lines: Power-angle diagram; surge impedance loading, Ferranti effect – Factors Affecting corona loss – Advantagesand Disadvantages of Corona-Methods of reducing corona effect.

UNIT IV CABLES AND INSULATORS 9

Underground cables: General Construction of cable – Types of cables- Advantages of Underground cables-Insulationresistance of a cable – Capacitance of a single core and three core cables- Grading of cables– Capacitance and intersheath grading.

Insulators: Properties of insulators-Types of insulators for overhead lines – Voltage distribution in insulator string and grading –String Efficiency – Calculating string efficiency-Methods of improving string efficiency.

UNIT V SUBSTATION AND DISTRIBUTION SYSTEMS 9

Calculations of Sag and Tension –– Supports at different levels – Factor of Safety-Effect of wind and ice – Requirements of a Tower-Type of Towers. Distribution system: Requirements of distribution system-Types of DC distribution system – Radial and Ring- main system-Classification of Substations- selection of site and location for a substation- Equipments for substations- Comparison between indoor and outdoor substation.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Differentiate the higher capacity AC and DC lines.

CO2 Compare the different types of conductors and characteristics.

CO3 Identify the transmission line systems for various ranges.

CO4 Gained the knowledge of the cables, the insulators and study of distribution system.

CO5 Examine the various types of substations.

TEXT BOOKS

1. Wadwa. C.L., “Electric Power Systems, New Age International (P) Ltd , 7th Edition, 2017.
2. Mehta.V.K, and Rohit Metha, ”Principles of Power System”, S.Chand, 4th Edition, 2014.

REFERENCE BOOKS

1. Luces M. Fualkenberry, Walter Coffer,“Electrical Power Distribution and Transmission”, PearsonEducation, 1st Edition, 1996.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

2. Despande.M.V, “Electrical Power Systems Design” , Tata McGraw Hill Publishing Company, New Delhi, 26th Reprint, 2006.
3. Stevenson.W.L., “Elements of Power System Analysis”, McGraw Hill, New Delhi, 4th Edition, 2014.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														
CO2	3				1								1		
CO3	2	2													
CO4	2	2													
CO5	2	2													

518EEP07 **ELECTRICAL MACHINES LABORATORY-II** **L T P C**
0 0 2 1

PREREQUISITE : Nil

COURSE OBJECTIVES

- To study the various characteristics of AC machines experimentally.

LIST OF EXPERIMENTS

1. Regulation of three-phase alternator by EMF method.
2. Regulation of three-phase alternator by MMF method.
3. Load test on three-phase alternator.
4. Regulation of three-phase salient pole alternator by slip test.
5. V and Inverted V curves of Three Phase Synchronous Motor.
6. Load test on three-phase squirrel cage induction motor.
7. Load test on three-phase slip ring induction motor.
8. Determination of Equivalent circuit through No load and blocked rotor tests on three-phaseinduction motor.
9. Separation of No-load losses of three-phase induction motor.
10. Load test on single-phase induction motor.
11. Determination of Equivalent circuit of single-phase induction motor.
12. Study of AC starters.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Identify the circuit connections of synchronous generators and motors.
CO2 Analyze the motors for specific applications.
CO3 Demonstrate practical experience in starting and testing of three-Phase induction motors.
CO4 Interpret the performance of single phase induction motor.
CO5 Examine the practical experience in speed control of three-Phase induction motors.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3	1		2	2								2		
CO2			2	2	2									2	1
CO3			2	3	2									2	1
CO4	3	2	1		3								1		
CO5			2	2	3									2	1

518EEP08 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

L	T	P	C
0	0	2	1

PREREQUISITE: Digital Logic Circuits and Linear Integrated Circuits and Applications.

COURSE OBJECTIVES

- Develop the code in assembly language programming.
- Interpret the Assembly code using 8085, 8086 processors and 8051 controllers.
- Test the developed code using 8085, 8086 processors and 8051 controllers.
- Demonstrate the interface peripherals with microprocessor and micro controller.
- Apply the interfacing in the real world applications.

LIST OF EXPERIMENTS

1. Programming for 8/16 bit Arithmetic operations Using 8085 Addition / subtraction / multiplication /division.
2. Programming with control instructions Using 8085 Increment / Decrement, Ascending / Descending.
3. Programming with control instructions Using Maximum / Minimum of numbers.
4. Code conversions using 8085: Hex. / ASCII / BCD code conversions.
5. Interface Experiments: - A/D Interfacing.
6. Interface Experiments: - D/A Interfacing.
7. Key board interfacing using 8279 with 8085.
8. Programming for 8/16 bit Arithmetic operations Using 8051 Addition / subtraction / multiplication /division.
9. Programming- Arithmetic operations Using 8086 Addition / subtraction / multiplication / division.
10. Programming with control instructions Using 8086 Increment / Decrement, Ascending / Descendingorder, Maximum / Minimum of numbers, Rotate instructions, Hex. / ASCII / BCD code conversions.
11. Interfacing and Programming of Traffic light controller using 8085.
12. Interfacing and Programming of Stepper Motor control using 8085.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Generate the code for arithmetic operations in assembly language.
CO2 Generalize the developed code using 8085, 8086 processors and 8051 controllers.
CO3 Identify the bugs in the assembly code using 8085, 8086 processors and 8051 controllers.
CO4 Reorganize the Interfacing peripherals with microprocessor and microcontroller.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO5 Propose the new design for real world applications.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	3	2	2		2							2	2		
CO3		3	2	2									2		
CO4			3	3	3				2		2	2	2	2	1
CO5			3	3	3				2		2	2	2	3	2

518EEP09 **DIGITAL ELECTRONICS LABORATORY**

L	T	P	C
0	0	2	1

PREREQUISITE: Digital Logic Circuits.

COURSE OBJECTIVES

- To design an experiment to produce various logical outputs.
- To study the output of code converters, shift registers, counters.
- To study the output of multiplexers and De-multiplexers.
- To study the output of synchronous sequential circuits.

LIST OF EXPERIMENTS

1. (a) Verification of truth table for logic gates AND, OR, EXOR, NOT, NOR, NAND
   (b) Verification of Characteristic table for Flip-flops JK FF, RS FF, T FF
2. Design and Implementation of Half/Full Adder and Subtractor using basic logic gates.
3. Design and Implementation of 4 bit binary adder / Subtractor and BCD Adder.
4. Design and Implementation of 16 bit even parity generator and checker.
5. Design and Implementation of 2 bit magnitude comparator using logic gates.
6. Design and Implementation of Code converters using logic gates
   (a) BCD to Excess – 3 Code and vice-versa
   (b) Binary to Gray codes and vice-versa
7. Design and Implementation of Encoders and Decoders using logic gates and study of IC7445 andIC74147.
8. Design and implementation of BCD to 7 segment display using decoder IC.
9. Design and Implementation of Multiplexers and Demultiplexers using logic gates and study of IC7474150 and IC74154.
10. Construction and Verification of 4 bit 4-bit modulo synchronous Counters.
11. Design and Implementation of 3-bit synchronous up-counter, down-counter using MSI circuits.
12. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable ICs.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Verify the digital logic circuits using digital ICs.
CO2 Apply Boolean functions and to implement those circuits practically.
CO3 Implement the different combinational logic circuits using logic gates.
CO4 Implement the synchronous sequential logic circuits using digital ICs.
CO5 Analyze the design and functioning of synchronous sequential circuits.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1	2												1		
CO2	2	2											2	1	
CO3	2	2				1							2	1	
CO4	2					1							3	2	1
CO5	2					1									

OPEN ELECTIVE-I

		L	T	P	C
518ECTO3/ 518ECO06	**COMMUNICATION THEORY**	**3**	**0**	**0**	**3**

PREREQUISITE : Nil

COURSE OBJECTIVES

- Understand working of various Amplitude modulation and demodulation systems.
- Explain about various Angle modulation and demodulation systems.
- Discuss transmitters and receivers of AM and FM.
- Understand the mathematical representation of noise.
- Understand the effect of noise on the performance of AM and FM receivers.

UNIT I AMPLITUDE MODULATION 9

Analysis of an AM Signal Spectrum –Generation and Detection of DSB-FC waves- Square law Modulator, Square law detector, Envelope Detector- Generation and Detection of DSB-SC waves- Balanced Modulator, Ring Modulator, Coherent detection, Costas loop, Generation and Detection of SSB-SC waves– Phase discrimination method, coherent detection, Generation and Detection of VSB Signals, Comparison of Amplitude modulation systems.

UNIT II ANGLE MODULATION 9

Phase modulation, Frequency modulation, Analysis of FM Signal Spectrum–Narrowband and wideband FM, Transmission Bandwidth of FM signals- Generation of FM signal – Direct FM ,Indirect FM, Demodulation of FM signals-Balanced slope Detector, Foster-Seeley Discriminator, PLL –Linear and non-linear model of PLL,FM stereo multiplexing .

UNIT III TRANSMITTERS AND RECEIVERS 9

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Classification of Transmitters- Block diagram of AM broadcasting transmitters- Low level and high level transmitters- FM transmitters.

Classification of Receivers- Receiver Characteristics- Tuned Radio frequency receiver- Super heterodyne receiver- Block diagram of FM receiver- Automatic frequency control- Automatic gain control.

UNIT IV NOISE THEORY 9

Gaussian Process. Noise – Shot noise, Thermal noise and white noise; Noise temperature; Noise Figure- Noise Bandwidth –mathematical representation of noise-Frequency Domain Representation of Noise, Power Spectral Density –Effect of a Filter on the Power spectral density of noise- Narrow band representation of noise and its PSD.

UNIT V NOISE PERFORMANCE AM AND FM RECEIVERS 9

Noise in AM Systems: Calculation of Signal Power and Noise Power in SSB-SC, DSB-SC and DSB-C. Figure of Merit of Square law and Envelope Detection. Noise in FM system: Mathematical Representation of the operation of the Limiter, Discriminator, Calculation of SNR- Threshold in FM– Pre-emphasis and De-emphasis.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Understand the modulation and its significance.

CO2 Analyze the different modulation systems.

CO3 Understand the frequency characteristics of noise.

CO4 Calculate and analyze noise performance in various receivers.

CO5 Calculate and analyze noise performance in various receivers.

TEXT BOOKS

1. Herbert Taub& Donald L Schilling – Principles of Communication Systems (3rd Edition) Tata McGrawHill, 2008
2. Simon Haykin, “Communication systems”, Willey Publication, New Delhi, 2011.
3. Kennedy G, “Electronic communication systems” Tata McGraw Hill, New Delhi, 2009.

REFERENCE BOOKS

1. John G. Proakis, MasoudSalehi, Fundamentals of Communication Systems, Pearson Education, 2006.
2. B.P.Lathi, Modern Digital and Analog Communication Systems, Third Edition, Oxford Press,2007.
3. P.Ramakrishnarao, “Communication Systems”, Published by McGraw Hill Education, 2013
4. Bruce Carlson - Communication Systems. (III Ed.), McGraw Hill.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1										2		
CO2	3		1									2	2		
CO3	3		3			2	2						2		1
CO4	3	3	1	2									3	2	
CO5	3		1									2			

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

518MEO07/ 715MET01	MECHATRONICS AND ROBOTICS	L	T	P	C
		3	0	0	3

PREREQUISITE : Applied Hydraulic and Pneumatics and Engineering Mechanics

COURSE OBJECTIVES

- To have knowledge on various types of sensors and transducer used in mechatronics system.
- To learn about the different system models and controllers used in mechatronics system.
- To comprehend the concepts of electrical circuits and signal conditioning.
- To learn the various types of grippers and selection of grippers.
- To know about the basic concepts associated with the design and functioning and applications of Robots.

UNIT I MECHATRONICS SENSORS AND TRANSDUCERS 9

Introduction to Mechatronics Systems, Measurement Systems, Control Systems - Microprocessor based Controllers, Sensors and Transducers, Performance Terminology, Sensors for Displacement, Position and Proximity, Velocity, Motion, Force, Fluid Pressure, Liquid Flow, Liquid Level, Temperature, Light Sensors, Selection of Sensors.

UNIT II SYSTEM MODELS AND CONTROLLERS 9

Building blocks of Mechanical, Electrical, Fluid and Thermal Systems, Rotational and Translational Systems, Electromechanical Systems, Hydraulic and Mechanical Systems.

Continuous and discrete process Controllers, Control Mode, Two - Step mode, Proportional Mode, Derivative Mode, Integral Mode, PID Controllers, Digital Controllers, Velocity Control, Adaptive Control, Digital Logic Control, Micro Processors Control.

UNIT III PROGRAMMING LOGIC CONTROLLERS AND DESIGN OF MECHATRONICS SYSTEM 9

Programmable Logic Controllers, Basic Structure, Input / Output Processing, Programming – Mnemonics, Timers, Internal relays and counters, Shift Registers, Master and Jump Controls, Data Handling, Analogs Input / Output, Selection of a PLC.

Stages in designing Mechatronics Systems, Traditional and Mechatronic Design, Possible Design Solutions, Autonomous mobile robot-Wireless surveillance balloon- Engine Management system-Automatic car park barrier.

UNIT IV ROBOT AND END EFFECTORS 9

Robot – Definition, Robot Anatomy, Co-ordinate Systems, Work Envelope, types and classification, Specifications - Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load, Robot Parts and Functions, Need for Robots, Different Applications.

End Effectors, Grippers - Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers, Vacuum Grippers, Two Fingered and Three Fingered Grippers, Internal Grippers and External Grippers, Selection and Design Considerations.

UNIT V ROBOT KINEMATICS AND ROBOT PROGRAMMING 9

Forward Kinematics, Inverse Kinematics and Differences, Forward Kinematics and Inverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional).

Teach Pendant Programming, Lead through programming, Robot programming Languages - VAL Programming - Motion Commands, Sensor Commands, End effector commands, and Simple programs.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course:

CO1 The students will be able to analyze mechatronics systems and different sensor used for displacement, position, velocity, motion, force, fluid pressure, temperature, etc.

CO2 The students acquire knowledge in system models of mechanical, electrical, fluid, thermal

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

systems and continuous and discrete process controllers.

CO3 The students will be familiar with the basic structure of programmable logic controllers and in designing mechatronics systems.

CO4 The students will be able to acquire the knowledge of different types and classification of robots, end effectors and robot kinematics.

CO5 The students will be able to gain the knowledge on robot programming languages.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Bolton W, "Mechatronics- Electronic Control Systems in Mechanical and Electrical Engineering", Pearson Education, 6th Edition, Indian Reprint, 2015.
2. M.P.Groover, "Industrial Robotics - Technology, Programming and Applications", Tata McGraw- Hill, 2nd Edition, Special Indian Edition, 2012.

REFERENCE BOOKS

1. Fu.K.S., Gonzalz.R.C., and Lee C.S.G., "Robotics Control, Sensing, Vision andIntelligence", McGraw-Hill Book Co.,2008.
2. Rajput. R.K, "A Textbook of Mechatronics", S. Chand & Co,2007.
3. Michael B. Histand and David G. Alciatore, "Introduction to Mechatronics and Measurement Systems", McGraw-Hill International Editions,2007.
4. Lawrence J. Kamm, "Understanding Electro - Mechanical Engineering, AnIntroduction to Mechatronics", Prentice - Hall of India Pvt., Ltd.,1995.
5. Janakiraman.P.A.,"Robotics and Image Processing", Tata McGraw-Hill,1995.
6. Yoram Koren, "Robotics for Engineers", McGraw-Hill Book Co.,1985.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3		1										2		
CO2	3		1									2	2		
CO3	3		3			2	2						2		1
CO4	3	3	1	2									3	2	
CO5	3		1									2			

518ITO08/ 318CITO06 **COMPUTER ORGANIZATION** **L T P C 3 0 0 3**

PREREQUISITE : Nil

COURSE OBJECTIVES

- To have insight into the basic structure of computers.
- To understand the design and implementation of ALU.
- To comprehend the importance of the memory and I/O communication.
- To familiarize basic concepts of Parallelism.

UNIT I BASIC STRUCTURE OF COMPUTER SYSTEM 9

Functional units – Basic operational concepts – Bus structures – Memory Locations and Addresses – Instructions andinstruction sequencing - Addressing modes –**RISC and CISC -** Basic I / O Operations.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT II COMPUTER ARITHMETIC AND CONTROL UNIT 9

Number Representation and Arithmetic Operations - Addition and Subtraction of Signed Numbers – Multiplication of Positive Numbers – Signed Operand Multiplication– Integer Division - Floating point Numbers andoperations - Control Units - Fundamental concepts – Instruction Execution– Hardwired control – Micro programmedcontrol.

UNIT III PIPELINING 9

Basic concepts – Data hazards – Instruction hazards - Unconditional branches – Conditional branches –Branch Prediction – Influence on instruction sets – Data path and control considerations - Super scalar operations – Performance considerations.

UNIT IV MEMORY & I/O ORGANIZATION 9

Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories – **PerformanceConsiderations of Cache memory - Virtual memory** - Accessing I/O devices – Interrupts – Direct Memory Access– Interface circuits – Standard I/O Interfaces: USB**, Firewire**.

UNIT V PARALLELISM 9

ILP – Concepts & Challenges – Compiler Techniques – Reducing branch costs – Dynamic scheduling - Parallel Processing and Performance- Hardware Multithreading – Flynn's Classification (SISD, MIMD, SIMD, SPMD) **-** Vector (SIMD) Processing - Shared-Memory Multiprocessors - Cache Coherence - Message-Passing Multi computers- Parallel Programming for Multiprocessors - Performance Modeling.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Understand basic operational concepts of computers, ALU and Instructions.

CO2 Know the computer arithmetic and control unit operations.

CO3 Comprehend and analyze the Pipelined Execution.

CO4 Know the various Memory Systems and I/O Organization.

CO5 Understand Parallelism and Multiprocessor architectures.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Carl Hamacher, Zvonko Vranesic and SafwatZaky & Narajg Manjikian – " Computer Organization and Embedded Systems", Sixth Edition, Tat McGraw Hill, 2012.

2. John L. Hennessey and David A. Patterson,- "Computer Architecture – A Quantitative Approach", Morgan Kaufmann/Elsevier Publishers, Sixth Edition, 2017.

REFERENCE BOOKS

1. David A. Patterson and John L. Hennessy, -"Computer Organization and Design: The Hardware / Softwareinterface", Fourth Edition, Elsevier, 2012.

2. William Stallings, - "Computer Organization and Architecture – Designing for Performance", Tenth Edition,Pearson Education, 2016.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2											1		
CO2	2		1										1	2	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

CO3	2	2											1	2	1
CO4	2	2											3	2	1
CO5	2	1											2		

518ECTO09/ 518ECT01	**DIGITAL SIGNAL PROCESSING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

PREREQUISITE : Signals and Systems

COURSE OBJECTIVES

- Compute FFT of a discrete time signal.
- Design the various FIR filter techniques.
- Design the various IIR filter techniques.
- Analyze the finite word length effects in signal processing.
- Device the fundamentals of digital signal processors.

UNIT I FAST FOURIER TRANSFORM AND CONVOLUTION 9

Introduction to DFT – Efficient computation of DFT- Properties of DFT – FFT algorithms – Radix-2 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms –sectioned convolution-overlap addmethod- overlap save method.

UNIT II FINITE IMPULSE RESPONSE DIGITAL FILTERS 9

Linear phase filters-Frequency response of linear phase FIR filters-Fourier series method of designing FIR filters- Windowing techniques for design of linear phase FIR filters: Rectangular-Hamming- Hanning-Blackman windows. Gibbs phenomenon –principle of frequency sampling technique- Realization - FIR filters-Directform,Cascade ,Linear phase FIR realization.

UNIT III INFINITE IMPULSE RESPONSE DIGITAL FILTERS 9

Review of design of analogue Butterworth and Chebyshev Filters- Frequency transformation in analog domain – Design of IIR digital filters using impulse invariance technique –bilinear transformation – pre warping –Frequencytransformation in digital domain – IIR Filter Realization - Direct form I, Direct form II, cascade and parallel.

UNIT IV FINITE WORD LENGTH EFFECTS 9

Quantization noise – truncation and rounding error-derivation for quantization noise power – Binary fixed point and floating point number representations – Comparison – input quantization error-coefficient quantization error-Product quantization error-limit cycle oscillations-dead band-Overflow error-signal scaling.

UNIT V DIGITAL SIGNAL PROCESSOR- TMTS320C54X 9

Introduction-Architecture of C54X – 'C54X buses-Internal memory organization-Central Processing unit- Arithmetic Logic unit-Barrel Shifter-Multiplier/Adder unit-Compare, select and store unit-On-chip Peripherals- External Bus Interface - Overview of instruction set –Arithmetic instructions-Data Transfer instructions-Logical instructions.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students should have the:

CO1 Calculate the FFT of a discrete time signal.

CO2 Demonstrate various FIR filter techniques.

CO3 Demonstrate various IIR filter techniques.

CO4 Summarize finite word length effects in signal processing.

CO5 Explain the fundamentals of Digital Signal Processor.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

TEXT BOOKS

1. John G Proakis- Dimtris G Manolakis- Digital Signal Processing Principles-Algorithms and Application-Pearson/PHI- 4th Edition- 2007-
2. S.K.Mitra- "Digital Signal Processing- A Computer based approach"- TataMcGraw-Hill- 1998- New Delhi.
3. B.Venkataramani& M-Bhaskar- Digital Signal Processor Architecture-Programming and Application-TMH 2002 .

REFERENCE BOOKS

1. Allan V.Openheim, Ronald W.Sehafer& John R.Buck-"Discrete Time Signal Processing",Third edition-Pearson/Prentice Hall,2014.
2. Johny R-Johnson: Introduction to Digital Signal Processing- Prentice Hall- 1984
3. Emmanuel I feachor "Digital Signal Processing: A Practical Approach", 2/E -Prentice Hall
4. Li Tan " Digital Signal Processing" Elsevier-2008

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3													
CO2	3	3													
CO3	3	3													
CO4	3	3	2												
CO5	2		2		2						2		3	2	1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Semester VI

		L	T	P	C
618EET01	**ELECTRICAL MACHINE DESIGN**	**3**	**0**	**0**	**3**

PREREQUISITE : Electrical Machines-I, Electrical Machines-II

COURSE OBJECTIVES

- To provide sound knowledge about Reluctance and EMF calculations.
- To study the design calculations of armature and field system for D.C machines.
- To design core, yoke, windings and cooling systems of transformers.
- To design stator and rotor of induction machines.
- To design the synchronous machines and Damper winding.

UNIT I INTRODUCTION 9

Major considerations in Electrical Machine Design – Limitations in design- Choice of Specific Electrical and Magnetic loadings – Fundamentals of magnetic circuit – Reluctance and MMF calculation for air gap and tooth – real and apparent flux density of rotating machines- Standard specifications.

UNIT II DESIGN OF D.C MACHINES 9

Review of Constructional details - Output Equation – Main Dimensions – Selection of number of poles – Design of Armature – Design of commutator and brushes – design of field pole and coils – Design problems.

UNIT III DESIGN OF TRANSFORMERS 9

Review of Constructional details – Main Dimensions - KVA output equation for single and three phase transformers-Overall dimensions – design of yoke, core and winding for core and shell type transformers – Optimum designs-Design of Tank and cooling tubes of Transformers- Design problems.

UNIT IV DESIGN OF THREE PHASE INDUCTION MOTORS 9

Review of Constructional details - Output equation of Induction motor – Main dimensions – choice of specific loadings – Design of Length of air gap – Design of stator - Design of squirrel cage rotor and wound rotor – Depth ofstator and rotor core- Design problems.

UNIT V DESIGN OF SYNCHRONOUS MACHINES 9

Review of Constructional details -Output equation – Main Dimensions -choice of specific loadings – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Slot dimensions – Estimation of air gap length – Design of rotor –Design of damper winding – Design of field winding – Design of turbo alternators- Designproblems.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Apply the concept of design considerations for all types of electrical machines.

CO2 Design the armature and field system of DC machines.

CO3 Design single and three phase transformers.

CO4 Design the stator and rotor of induction motor.

CO5 Design and analyze Synchronous machine parameters.

TEXT BOOKS

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 6th Edition, 2010.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

2. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford andIBH Publishing Co. Pvt. Ltd., New Delhi, 2nd Edition, 2011.

3. R.K. Agarwal, 'Principles of Electrical Machine Design', S.K.Kataria and Sons, Delhi, 4th Edition,Reprint 2019.

REFERENCE BOOKS

1. V.N. Mittle and A. Mittle, 'Design of Electrical Machines', Standard Publications Distributors,Delhi, 5th Reprint Edition, 2013.

2. Shanmugasundaram, A., Gangadharan G. and Palani R., "Electrical Machine Design DataBook", New Age International (P) Ltd, 2nd Edition, 2015.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2											3	3	1
CO2	2	3	3										2	3	
CO3	2	3	3										2	3	1
CO4	2	3	3										2	3	
CO5					3								2	3	

618EET02 **POWER ELECTRONICS**

L	T	P	C
3	0	0	3

PREREQUISITE : Electron Devices and circuits

COURSE OBJECTIVES

- To get an overview of different types of power semi-conductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers.
- To study the operation, switching techniques and basic topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand and the harmonic reduction methods.
- To know the practical application for power electronics converters in conditioning the power supply

UNIT I POWER SEMI-CONDUCTOR DEVICES 9

Construction, Principle of operation – Static and dynamic characteristics of Power diodes, SCR, TRIAC, GTO, power BJT, power MOSFET IGBT and SiC – Types of power diodes – Two Transistor model of a thyristor – Turn on and Turn off methods of thyristor-series and parallel operation of thyristor- Applications

UNIT II PHASE CONTROLLED CONVERTERS 9

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

AC to DC converters: single phase and three phase half and fully controlled converters with R, RL and RLE loads – Estimation of average and RMS load voltage and current – input power factor – Dual converters – Effect of source impedance on the performance of converter: single phase and three phase converter-Applications.

UNIT III DC TO DC CONVERTER 9

DC to DC converters: Principle of Chopper operation – Time ratio control –step up and step down choppers– classification of chopper – Buck, Boost, Buck-boost and flyback configurations- Design of Inductors- Applications

UNIT IV INVERTERS 9

DC to AC converters: Inverters– Types: voltage source and current source inverters – single phase bridge inverters – three phase bridge inverters :120 and 180 mode of operation- current sourceinverters: single phase capacitor commutated CSI – single phase Auto Sequential commutated CSI – PWM Inverter-Harmonic reduction –Applications.

UNIT V CYCLOCONVERTER AND AC VOLTAGE REGULATOR 9

Single phase to single phase cycloconverter - three phase to single phase and three phase to three phase cycloconverter-AC voltage controller: Single phase voltage controller with R,RL Load-Three phase voltage controller- Applications.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Illustrate the principles of operation, performance of power semiconductor devices.

CO2 Develop and Estimation of the function of single phase and three phase controlled converters.

CO3 Demonstrate and operation various commutation of the choppers.

CO4 Correlate the different modes of operation of inverters.

CO5 Interpret the knowledge basic concepts and principles of operation on cycloconverters and AC voltage regulators.

TEXT BOOKS

1 Rashid, M.H., 'Power Electronics - Circuits Devices and Applications', Prentice Hall of India, 4th Edition, 2017.

2 Singh.M.D and Kanchandani-'Power Electronics'-Tata McGraw-Hill & Hill publication Company Ltd., New Delhi, 13th Edition, 2008.

3 Vedam Subrahmanyam, "Power Electronics", New Age International (P) Limited, NewDelhi, 5th Edition, 2012.

REFERENCE BOOKS

1. Joseph Vithayathil, "Power Electronics", Mc Graw Hill series in Electrical and Computer Engineering , USA., 2nd Edition, 2019.
2. Dubey, G.K., Doradia, S.R., Joshi, A. and Sinha, R.M., 'Thyristorised Power Controllers', New Age International (P) Ltd, 2nd Edition, 2015.
3. Dr.P.S.Bimbhra, "Power Electronics", khanna Publishers, 6th Edition, 2018.
4. Philip T Krein, "Elements of Power Electronics", Oxford University Press, Inc., New York,2nd Edition, 2014.

COs	Programme Outcomes	Programme Specific Outcomes

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3												2		1
CO2	3	2	1											3	
CO3	3	2	2										2		
CO4	3	2	1										2		
CO5	2	1			2								3		

618EET03 **POWER SYSTEM ANALYSIS AND STABILITY**

L	T	P	C
3	1	0	4

PREREQUISITE : Numerical Methods & Transmission and Distribution

COURSE OBJECTIVES

- Per unit analysis, impedance diagram, reactance diagram, construction of Y-bus and Z-bus matrix.
- Importance of power flow analysis, classification of buses and iterative techniques for power flow analysis.
- Symmetrical fault analysis using Thevenin's theorem and Z bus building algorithm.
- Unsymmetrical fault analysis, symmetrical components and sequence networks analysis.
- Stability analysis in power system planning, development of swing equation and equal area criterion.

UNIT I INTRODUCTION 12

Need for system planning and operational studies – basic components of a power system – Single line diagram – per unit analysis –per unit impedance diagram – per unit reactance diagram – Generator - transformer – transmission line and load representation for different power system studies. - Primitive network - construction of Y-bus using inspection and singular transformation methods – construction of Z-bus using building algorithm- Introduction to restructuring of power system.

UNIT II POWER FLOW ANALYSIS 12

Importance of power flow analysis in planning and operation of power systems - statement of power flow problem - classification of buses - development of power flow model in complex variables form and polar form - iterative solution using Gauss-Seidel method-Newton-Raphson method and Decoupled method-comparisons of three methods.

UNIT III FAULT ANALYSIS- BALANCED FAULTS 12

Importance of short circuit analysis - assumptions in fault analysis - analysis using Thevenin's theorem –Z-bus building algorithm - fault analysis using Z-bus – computations of short circuit capacity, post fault voltage and currents.

UNIT IV FAULT ANALYSIS – UNBALANCED FAULTS 12

Introduction to symmetrical components – sequence impedances – sequence circuits of synchronous machine, transformer and transmission lines - sequence networks analysis of single line to ground, line to line and double line to ground faults using Thevenin's theorem and Z-bus matrix.

UNIT V STABILITY ANALYSIS 12

Importance of stability analysis in power system planning and operation - classification of power

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

system stability - angle and voltage stability – Single Machine Infinite Bus (SMIB) system: Development of swing equation - equal area criterion - determination of critical clearing angle and time – solution of swing equation by modified Euler method and Runge-Kutta fourth order method.

TOTAL:60 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Illustrate Per unit analysis, impendence diagram and reactance diagram, construct Y bus and Z bus matrix.

CO2 Recognize the importance of power flow analysis, classification of buses and iterative techniques for power flow analysis.

CO3 Illustrate symmetrical fault analysis using Thevenin's theorem and Z bus building algorithm.

CO4 Categorize the unsymmetrical fault and estimate symmetrical components.

CO5 Recognize the stability analysis in power system planning, development of swing equation and equal are criterion.

TEXT BOOKS

1. John J. Grainger and Stevenson Jr. W.D., 'Power System Analysis', Tata McGraw Hill, 2017.
2. HadiSaadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi,3rd Illustrated Edition, 2010.
3. Nagrath. I.J, Kothari. D.P, "Modern Power system Analysis", Tata McGraw Hill Pub. Co. Ltd., 4thEdition, 2011.

REFERENCE BOOKS

1. Kundur P., 'Power System Stability and Control, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint 2010.
2. "Pai M A, 'Computer Techniques in Power System Analysis', Tata McGraw-Hill PublishingCompany Ltd., New Delhi, 2nd Edition, 2007.
3. Wadwa. C.L., "Electric Power Systems, New Age International (P) Ltd, 7th Edition, 2017.
4. Gleen W.Stagg, Ahmed H. Ei-Abiad, 'Computer Methods in Power System Analysis', MedtechPublisher, 1st Edition, 2019.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3		2									3		
CO2	3	2	2	2									2		2
CO3	3	2		2									2	2	
CO4	3	2	2	1									2		
CO5	3	2			3				1				3	2	

618EET04 **HIGH VOLTAGE ENGINEERING**

L	T	P	C
3	0	0	3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

PREREQUISITE :Transmission and Distribution & Power Electronics

COURSE OBJECTIVES

- To understand the various types of over voltages in power system.
- Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- Generation of over voltages in laboratories and Measurement of over voltages.
- Discussion on Testing of power apparatus and International and Indian Standards.

UNIT I TRANSIENT OVERVOLTAGES IN ELECTRIC POWER SYSTEMS 9

Natural causes of over voltages - Lightning phenomena - Over voltages due to switching surges – Characteristics of switching surges- control of over voltage due to switching- System faults and other abnormal conditions – Traveling waves on transmission lines.

UNIT II ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS 9

Ionization processes – Townsend's Criterion - Paschen's law - Streamer theory - Breakdown in non-uniform fields and corona discharges – Practical considerations in using gases for insulation purposes - Vacuum insulation. Conduction and breakdown in pure and commercial liquids. Intrinsic breakdown in solids - Electromechanical breakdown - Thermal breakdown - Breakdown in composite dielectrics.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9

Generation of high DC voltages, high alternating voltages, impulse voltages and impulse currents – Tripping and control of impulse Generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

Measurement of high DC voltages, high AC voltages and impulse voltages - Measurement of high DC currents, high AC currents and impulse currents - CRO for impulse voltage and current measurement - Digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING OF ELECTRICAL POWER APPARATUS 9

Testing of Insulator, Bushings, Isolators, Circuit breakers, Cables, Transformers, Surge Arresters Partial Discharge measurement – Radio interference measurement – International and Indian Standards.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Ability to understand in transients over voltages in power system.

CO2 Gain knowledge in the fundamental concept of electric breakdown in liquids, solids and gases.

CO3 Extrapolate the Generation of various types of high voltages and high currents.

CO4 Extrapolate the measurement of various types of high voltages and high currents.

CO5 Outline the Indian and international standards for high voltage testing of power apparatus.

TEXT BOOKS

1. M.S. Naidu and V.Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, 5thEdition,2017.
2. Kuffel, E ,Zaengl, W.S and Kuffel.J,'High Voltage Engineering Fundamentals',ReedElsevier India Pvt. Ltd , 2nd Edition, 2012.

REFERENCE BOOKS

1. Kuffel, E and Abdullah, M., 'High Voltage Engineering', Pergamon Press, Oxford, 1st IndianEdition,1970.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3												2		
CO2	3	2											2		
CO3	3	2											2	2	1
CO4	3	2											2	2	1
CO5	3			1									2	2	1

618EET05 **RENEWABLE ENERGY SOURCES**

L	T	P	C
3	0	0	3

PREREQUISITE : Power Generation Systems

COURSE OBJECTIVES

- To understand the principle of working and the components of different non-conventional sources of energy and their utilization.
- To get an exposure on the power plants working with non-conventional energy.
- To study and compare the different non-conventional sources of energy and their performance.

UNIT I INTRODUCTION **9**

Energy Conservation and Energy Efficiency – Needs and Advantages, Different types of Renewable Energy Sources - Energy Resources Availability in World –Environmental aspects of energy utilization – Statistical Report on Renewable energy scenario in India - Applications.

UNIT II SOLAR ENERGY **9**

Introduction to solar energy: solar radiation, availability, measurement and estimation – Solar thermal conversion devices and storage – solar cells and photovoltaic conversion – PV systems – MPPT.Applications of PV Systems – solar energy collectors and storages-Estimation & Design.

UNIT III WIND ENERGY **9**

Introduction – Basic principles of wind energy conversion – wind data and energy estimation – site selection consideration – basic components of wind energy conversion system –Types of wind turbines - Schemes for electric generations – generator control, energy storage – applications of wind energy – Inter connected systems- Estimation & Design.

UNIT IV BIO MASS ENERGY AND OTHER ENERGY SOURCES **9**

Biomass: Introduction, Biomass conversion technologies, photosynthesis, classification of biogas plants. Biomass direct combustion – Biomass gasifier Biogas plant – Ethanol production – Bio diesel.

Cogeneration: Biomass applications. Tidal energy: Basic principles of tidal power, components of tidalpower plants, operation methods of utilization of tidal energy – Wave energy and its energy conversiondevices, Open and Closed OTEC cycle. Geothermal energy and Fuel cells.

UNIT V GRID INTEGRATION **9**

Introduction to renewable energy grid integration, concept and need of mini/micro grids, and smart grids.Regulations regarding grid interconnections of renewable energy systems.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO1 Create awareness about the scenario of energy consumption and energy availability in India and world.

CO2 Evaluate the necessity and potential advantages of renewable energy resources like solar thermal and PV system over fossil fuels.

CO3 Examine the process of power generation using bio gas, wind energy and biomass.

CO4 Analyze the functioning of Geo thermal, ocean and small hydro plants and grid integration.

CO5 Create an linking all real time possible ways to generate the power by hybrid mode and optimal.

TEXT BOOKS

1. G.D. Rai, Non-Conventional Energy Sources, Khanna Publishers, New Delhi, 6th Edition, 2015.
2. S.P. Sukhatme, J.K Nayak, Solar Energy, Tata McGraw Hill Publishing Company Ltd.,New Delhi, 4th Edition, 2017
3. Chetan Singh Solanki, Solar Photovoltaic Technology and Systems, Prentice Hall of India,1st Edition, 2015.

REFERENCE BOOKS

1. John Twidell, Tony Weir, Renewable Energy Sources, Routledge Publisher, 3rd Edition, 2019.
2. D. P. Kothari, K. C. Singal, Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies,Prentice Hall of India, 2nd Edition, 2016.
3. Godfrey Boyle, "Renewable Energy: Power for a Sustainable Future", Oxford University Press,U.K.,3rd Edition, 2013.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	1											2		
CO2	3	2											2		
CO3	2	1											2	2	1
CO4	2	1											2	2	1
CO5	2	2											3	2	1

618EEP07 **POWER ELECTRONICS LABORATORY**

L	T	P	C
0	0	2	1

PREREQUISITE : Electrical and Electronics Circuit Simulation Lab

COURSE OBJECTIVES

- To study the characteristics and applications of power switching devices through experimentally.

LIST OF EXPERIMENTS

1 VI and Switching characteristics of SCR and TRIAC.
2 VI and Switching characteristics of MOSFET and IGBT.
3 Single phase and Three phase half controlled Rectifiers.
4 Single phase and Three phase fully controlled Rectifiers

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

5 Step up and step down chopper.
6 Single phase IGBT inverter.
7 Three phase IGBT inverter.
8 Resonant dc-to-dc converter
9 Buck Boost / flyback Voltage and current commutated chopper.
10 Single phase AC voltage controllers.
11 Single-phase cycloconverter.
12 Series and parallel inverter.
13 Simulation of Single phase and Three phase half and fully controlled Rectifiers using PSPICE or MATLAB.
14 Simulation of Single phase and Three phase Inverters using PSPICE or MATLAB.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Interpret to describe about modern power semiconductors and their control.
CO2 Examine and experimentally quantify steady state and transient characteristics of power converters.
CO3 Demonstrate and build complete converters, choppers and inverters.
CO4 Identify the variable output voltage using AC voltage controller.
CO5 Analyze the variable output voltage using Single-phase cycloconverter.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3		3					2	1			3		
CO2	3	3		3					2	1			3		1
CO3	3	3		3	2				2	1			3	2	1
CO4	3	2											2	2	
CO5	3	2											3	2	

618EEP08 ELECTRONIC SYSTEM DESIGN LABORATORY

L	T	P	C
0	0	2	1

PREREQUISITE: Electrical and Electronics Circuit Simulation Lab.

COURSE OBJECTIVES

- To make the students to learn the design procedures and fabrication techniques of small electrical & electronics circuits..

LIST OF EXPERIMENTS

1 Design and Fabrication of 5V Constant Voltage Power supply
2 Design and Fabrication of 0-12 V, 1A Variable Power Supply
3 Design and Fabrication of Driver Circuit to drive an Electromagnetic relay using Microprocessorwith required Protection.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

4 Design and Fabrication of an isolation circuit using opto coupler which is requiredforMicrocontroller interfacing
5 Design and Fabrication of Domestic UPS
6 Sound operated timer circuit
7 Motion Detector Using NE555 Timer
8 Smart Cell phone Guard
9 Optical smoke alarm
10 Automatic Anchor Light
11 Design of Driver circuit for MOSFET and IGBT.
12 Design of UJT and RC triggering circuit for SCR.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Design power supply units.
CO2 Design driver circuit for different ICs.
CO3 Design and fabricate opto-coupler and timer IC based circuits.
CO4 Design domestic Kits for different applications.
CO5 Analyze the performance of domestic kits.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1								2	3	
CO2	3	3	3	2	1								2	3	
CO3	3	3	2										3	3	
CO4	1	2	3									2	2	3	2
CO5	1	2	3									2	3	2	

618EEP09 EMPLOYABILTIY SKILLS LABORATORY

L	T	P	C
0	0	2	1

PREREQUISITE: Nil.

COURSE OBJECTIVES

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them enrich their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their career.
- To enhance the performance of the students in the recruitment processes, self enhancement and launching start ups.

UNIT I LISTENING 7

Listening Audios and answering MCQs - Watching video clips on famous speeches, motivational

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

videos, documentariesand answering MCQs - Listening Comprehension and TED talks.

UNIT II SPEAKING 10

Prepared talk - Extempore - story knitting - Picture Talk - Brainstorming - Debate - Group Discussion - Elevator Speech - Mock HR Interviews - Story Narration - Miming - Short Skits.

UNIT III READING 12

Reading Comprehension - Verbal Analogy - Classification - Alphabet Test - Logical Sequence of Words - Statement & Conclusions - Statement & Courses of Action - Situation Reaction Test - Theme Detection - Deriving Conclusions from Passages.

UNIT IV WRITING 7

Business Letters - Email Writing - Essay Writing - Paragraph Writing - Paraphrasing.

UNIT V CAREER SKILLS 9

Vocabulary Test (GRE, TOEFL, TOEIC & CAT Exam words) - Confused Pair of words - Contronyms - One Word Substitution - Sequencing of Sentences – Sentence correction.

TOTAL: 45 PERIODS

LAB REQUIREMENTS

1. Teacher console and system for students.
2. English Language Lab Software
3. Career Lab Software

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Comprehend the various strategies of listening and its significance.

CO2 Articulate their views clearly and concisely with self-confidence and persuasiveness.

CO3 Understand the prevailing practices of testing in the recruitment process by the corporate and the institutional selection processes.

CO4 Communicate the corporate and social requirements in an impressive written mode.

CO5 Enhance their verbal skills in the screening tests competently both for recruitment and pursuing higher studies as well.

TEXT BOOKS

1. Agarwal R. S., A Modern Approach to Verbal and Non-verbal Reasoning, Chand & Co.,
2. Ashraf Rizvi M. Effective Technical Communication. TATA McGraw Hill, New Delhi: 2007.

REFERENCE BOOKS:

1. Lingua: Essays for TOEFL/IELTS, Dreamtech Press, New Delhi, 2016.
2. Lily Mangalam, Global English Comprehension, Allied Publishers Pvt. Ltd., New Delhi,2014.
3. Sharon Weiner Green and Ira K. Wolf, Barron's GRE, Glagotia Publications Pvt. Ltd.,18th Edition, New Delhi, 2011.
4. Mohamed Elias, R. Gupta's IELTS/TOEFL Essays, Ramesh Publishing House, 6th Edition,New Delhi, 2016

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	1											2		1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO2	3	3											2		1
CO3	3	3											3		2
CO4	3	2											2		2
CO5	3	2			1								2		3

PROFESSIONAL ELECTIVE-IV

		L	T	P	C
618EEE01	**DISTRIBUTED GENERATION AND MICRO GRID**	**3**	**0**	**0**	**3**

PREREQUISITE : Nil

COURSE OBJECTIVES

- To illustrate the concept of distributed generation.
- To analyze the impact of grid integration.
- To study concept of Microgrid and its configuration.
- To analyze control and protection of microgrid.

UNIT I INTRODUCTION **9**

Conventional power generation: advantages and disadvantages, Energy crises, Non- Conventional Energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.

UNIT II DISTRIBUTED GENERATIONS **9**

Concept of distributed generations, topologies, selection of sources, regulatory standards/ framework, Standards for interconnecting Distributed resources to electric power systems: IEEE 1547. DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, flywheels. Captive power plants.

UNIT III IMPACT OF GRID INTEGRATION **9**

Requirements for grid interconnection, limits on operational parameters: voltage,frequency, THD, response to grid abnormal operating conditions, islanding issues. Impact of grid integration with non-conventional energy sources on existing power system: reliability, stability and power quality issues.

UNIT IV BASICS OF MICROGRID **9**

Concept and definition of micro grid, microgrid drivers and benefits, review of sources of microgrids, typical structure and configuration of a microgrid, AC and DC microgrids, Power Electronicsinterfaces in DC and AC microgrids.

UNIT V CONTROL AND OPERATION OF MICROGRID **9**

Modes of operation and control of microgrid: grid connected and islanded mode, Active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques, microgrid communication infrastructure, Power quality issues in microgrids, regulatorystandards, Microgrid economics, Introduction to smart microgrids.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Comprehend the various schemes of conventional and non-conventional power generation.

CO2 Analyze the energy sources of distributed generation.

CO3 Synthesis impacts of grid interconnection.

CO4 Comprehension about the fundamental concepts of Microgrid.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO5 Evaluate the protection issues and control schemes.

TEXT BOOKS

1. John Twidell, Tony Weir, Renewable Energy Sources, Routledge Publisher, 3rd Edition, 2019.
2. Rajeev Kumar Chauhan and Kalpana Chauhan, Distributed Energy Resources in Microgrid, Academic Press, 1st Edition, 2019.
3. S. Chowdhury, S.P. Chowdhury and P. Crossley, Microgrids and Active Distribution Networks, Institution of Engineering and Technology, 2009.

REFERENCE BOOKS

1. Nikos Hatziargyriou, "Microgrids: Architectures and Control" Wiley-IEEE Press, 1st edition, 2014.
2. Papia Ray and Monalisa Biswal, "Microgrid: Operation, Control, Monitoring and Protection, Kindle edition, Springer Publications, 2020.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2		1						1				2		1
CO2	2		2						2				2		1
CO3	2		2						2				2	3	2
CO4	3	2	2						2				2	2	1
CO5			3		2				3				2	2	1

618EEE02 **VLSI DESIGN**

L	T	P	C
3	0	0	3

PREREQUISITE : Digital Logic Circuits

COURSE OBJECTIVES

- To acquaint with the basis of MOS theory and Manufacturing Technology.
- To analyze the switching characteristics of MOS transistor/stick diagram and design rules.
- To study about the construction of NMOS,CMOS and BiCMOS based logic gates.
- To familiarize FPGA architecture and Programming of programmable devices.
- To design the Programming of Programmable device using Hardware description language.

UNIT I BASIC MOS TRANSISTOR THEORY 9

Basic MOS Transistor- MOSFET Threshold Voltage-Enhancement and Depletion mode operation-Saturation and linear mode operation-CMOS Fabrication: P well, N Well and Twin Tub process – Sub micron technology.

UNIT II NMOS AND CMOS CIRCUIT DESIGN 9

MOS Layers- Stick Diagrams- Design rules and layout diagram –Sheet resistance–Area capacitance of layers –NMOS Inverter –CMOS inverter - Determination of pull up / pulldown ratios – Switching characteristics. Rise time. Fall time –Latch-up problem in CMOS Circuits.

UNIT III SUB SYSTEM AND LOGIC DESIGN 9

Pass Transistor and Transmission gates- NMOS and CMOS Logic gates- CMOSCombinational Logic Design-Clocked Sequential Logic Circuits –super buffers – BiCMOS.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT IV DESIGN OF COMBINATIONAL ELECMENTS AND ARRAY LOGIC 9

Read Only Memory (ROM)- PLA, PAL, GAL – Complex Programmable Logic Devices (CPLD)- Field Programmable Logic Devices(FPGA)- Xilinx 4000 Series FPGA:CLB,I/OBlocks – FPGA Design Flow..

UNIT V CIRCUIT DESIGN USING VHDL 9

RTL Design – Structural level Design –combinational logic – Types – Operators – Packages– Sequential circuit – Sub programs – Test benches. (Examples: adder, counters, flip flops, FSM, Multiplexers / Demultiplexers)- Introduction to Verilog.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Implicit the fundamentals of MOS transistor and fabrication techniques.

CO2 Apprehend the characteristics of MOS and CMOS circuits.

CO3 Capable to design the NMOS, CMOS and BiCMOS based logic circuits.

CO4 Emphasis knowledge in the PLDs and CPLDs and design using FPGA.

CO5 Expose to HDL language and ability to design simple devices.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Douglas A. Pucknell, Kamran Eshraghian, 'Basic VLSI Design', 3rd Edition, Prentice Hallof India, New Delhi, 2015.
2. Debaprasad Das, VLSI Design, Oxford University Press, 2nd Edition,2016.
3. Eugene D.Fabricius, 'Introduction to VLSI Design', Tata McGraw Hill, 1990.

REFERENCE BOOKS

1. N.H.Weste, "Principles of CMOS VLSI Design", Pearson Education, India, 2nd Edition,2008
2. Charles H Roth Jr., "Digital System Design Using VHDL", Cengage learning Publisher,1st Edition, 2006.
3. Zainalabedin Navabi, 'VHDL Analysis and Modelling of Digital Systems',Tata McGrawHill, 2nd Edition , 1998.
4. Parag K.Lala, 'Digital System Design using PLD', BS Publications, 1st Edition, 2009.
5. Mukherjee, Amar, "Introduction to NMOS and CMOS VLSI system design", Prentice Hall, 1986.
6. Douglas L Perry, 'VHDL Programming by Example', McGraw Hill, 4th Edition.2002.
7. Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic with Verilog Design",Tata Mcgraw Hill Publishing Co. Ltd., 2nd Edition, 2015.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3		1										2		
CO2	3		2										2		
CO3	3		3			2	2						1	3	1
CO4	3	3	1	2									1	3	1
CO5	3		1										1	3	1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

618EEE03	HIGH VOLTAGE DIRECT CURRENT TRANSMISSION	L	T	P	C
		3	0	0	3

PREREQUISITE : Transmission and Distribution

COURSE OBJECTIVES

- To study about importance of HVDC transmission.
- To study about Analysis of HVDC converters, Faults and Protections.
- To study about Harmonics and Filters I.
- To study about Reactive power control and power factor improvements of the system.

UNIT I BASIC CONCEPTS 9

Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC & DC Transmission, Application of DC Transmission System – Planning for HVDC transmission & Modern trends in HVDC Technology.

UNIT II ANALYSIS OF HVDC CONVERTERS 9

Choice of Converter configuration – Analysis of Graetz circuit with and without overlap – characteristics of6 Pulse & 12 Pulse converters – Cases of two 3 phase converters in star –star mode – their performance.

UNIT III CONVERTER & HVDC SYSTEM CONTROL 9

Principle of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system- Starting and stopping of DC link- PowerControl – Higher level controllers.

UNIT IV REACTIVE POWER CONTROL IN HVDC 9

Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies- sources of reactive power- shunt capacitors-synchronous condensers.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Modeling of DC Links-DC Network-DC Converter-Controller Equations-Solution of DC load flow – P.U. System for DC quantities-solution of AC-DC Power flow-Simultaneous method Sequential method.Types of AC filters, Design of Single tuned filters –Design of High pass filters.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Cognitive of basic concepts of HVDC systems.
CO2 Comprehension of power factor improvements of the system
CO3 Emphasis knowledge in the converter control systems.
CO4 Analyze the reactive power control in HVDC.
CO5 Evaluate the concept of Power flow analysis in AC/DC systems.

TOTAL: 45 PERIODS

TEXT BOOKS

1. K.R.Padiyar , HVDC Power Transmission Systems, New Age International publishers, 3rd Edition, 2017
2. Rao.S, EHVAC and HVDC Transmission Engineering, Khanna Publishers, 16th Edition, 2014.

REFERENCE BOOKS

1. Jos Arrillaga , High Voltage Direct Current Transmission, The British Library Publishers, 2nd Edition, 1998.
2. Edward Wilson Kimbark, Direct Current Transmission, Volume-1, John Wiley & Sons, 1st Edition, 1971.
3. Erich Uhlmann, Power Transmission by Direct Current, Springer Verlag Publishers, 1st Edition, 2009.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3												2		
CO2	3		1										2		1
CO3	3				2	1						1	2	2	1
CO4	3					1						1	2	2	1
CO5	3				2	1						1	2	2	1

618EEE04 **ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

L	T	P	C
3	0	0	3

PREREQUISITE : Nil

COURSE OBJECTIVES

- To study idea of intelligent agents and search methods.
- To study about representing knowledge.
- To study the reasoning and decision making in uncertain world.
- To construct plans and methods for generating knowledge.
- To study the concepts of Data Science and analysis.

UNIT I **ARTIFICAIL INTELLIGENCE** **9**

The state of art-Intelligent Agents-Structure-Environment-Definition of AI-AI problems- AI techniques-Artificial intelligence in practice-concepts of AI-Emergence of artificial intelligence.

UNIT II **SEARCH STRATEGIES OF AI** **9**

Heuristic search techniques-depth first search-depth limited search-Uniform cost search-breadth first search-hill climbing and best first search techniques-Comparing search techniques.

UNIT III **MACHINE LEARNING** **9**

Introduction- data preprocessing-supervised learning-supervised learning classification-unsupervisedlearning – learning objectives – features of machine learning

UNIT IV **INTRODUCTION TO DATA SCIENCE** **9**

Introduction to Big Data Platform – Challenges of Conventional Systems – Intelligent data analysis – Nature of Data – Analytic Processes and Tools – Analysis Vs Reporting – Modern Data Analytic Tools – Statistical Concepts: Sampling Distributions – Re-Sampling – Statistical Inference – Prediction Error.

UNIT V **EVOLUTION OF DATA ANALYTICS** **9**

Importance of data analytics-data analytics overview and process flow-data analytics lifecycle-types of data analytics-descriptive analytics-data analytics benefits-decision making-case studies.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Familiar with the idea of intelligent agents and search methods.

CO2 Do reasoning and decision making in uncertain world.

CO3 Illustrate language processing and learning.

CO4 Illustrate the concepts of Data Science.

CO5 Analyze the concepts of Data Science.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

TEXT BOOKS

1. Elaine Rich, Kevin knight, Shivashankar B Nair, "Artificial Intelligence", TMH, 3rd Edition, 2018.
2. Dan W Patterson, "Introduction to Artificial Intelligence and Expert Systems", Pearson EducationLimited, 1st Edition, 2016.
3. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2nd Revised Edition, 2010.

REFERENCE BOOKS

1. Stuart Russell and Peter Norvig, "Artificial Intelligence-A Modern Approach", PearsonEducation Limited, 3rd Edition, 2017.
2. Eugene Charniak, Drew McDermott, "Introduction to Artificial Intelligence", PearsonEducation Limited, 1st Edition, 2013.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams withAdvanced Analytics", Wiley India Pvt Limited, 1st Edition, 2014.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3		1	1					2				2		
CO2	3	2	2	1					2				2		
CO3	3	2	2	1					2				3	2	2
CO4	3	1	2	1					2				3	2	2
CO5	2		2							2		2	3	2	2

Semester VII

		L	T	P	C
718EET01	**POWER SYSTEM OPERATION AND CONTROL**	**3**	**1**	**0**	**4**

PREREQUISITE :Transmission and Distribution & Power System Analysis and Stability

COURSE OBJECTIVES

- To get an overview of system operation and its control in power system.
- To study about the load forecasting, economic dispatch and unit commitment problems in power systems.
- To understand the model of power frequency dynamics in single and two area systems and to design power-frequency controller.
- To understand the reactive power-voltage interaction and different methods of control for maintaining voltage profile against varying system load.
- To understand the control of power systems security and monitoring.

UNIT I INTRODUCTION **12**

System load variation: System load characteristics, load curves - daily, weekly and annual, load-duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control: Governor control, LFC, EDC, AVR, system

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

voltage control, security control.

UNIT II SYSTEM OPERATION 12

System load forecasting – components of system load – classification of base load - forecasting the base load – forecasting procedure Economic dispatch – Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ-iteration method. (No derivation of loss coefficients.) Base point and participation factors. Economic dispatch controller added to LFC.

Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost.

UNIT III SYSTEM CONTROL- REAL POWER- FREQUENCY CONTROL 12

MW – frequency interaction – load-frequency mechanism – load frequency control – Q- IVI control – interaction between P – f and Q - IVI channels – Basic control loops Fundamentals of speed governing – Transfer function model – speed governing system – Turbo generator - Static response – Feedback control– static and dynamic response of ALFC – secondary ALFC loop AGC in isolated power systems - AGCin interconnected power systems – Two area system – modeling of tie line – representation of two area system – static and dynamic response – tie line bias control – Frequency bias tie line control.

UNIT IV SYSTEM CONTROL- REACTIVE POWER- VOLTAGE CONTROL 12

Reactive power and voltage control - Production and absorption of reactive power - Methods of voltage control - Shunt reactors, Shunt capacitors, Series capacitors, synchronous condensers - Static VAR Systems- Types of SVC - Application of Static VAR compensators Excitation systems requirements - Elements of an excitation system - Types of excitation systems - DC, AC, Static and recent developments and future trends – Modeling of exciter, generator – static performance – dynamic performance.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 12

Energy control center: Functions – Monitoring, data acquisition and control-System hardwareconfiguration – SCADA and EMS functions: Network topology determination, state estimation, security analysis and control. Various operating states: Normal, alert, emergency, in-extremis and restorative.

TOTAL:60 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Identify the planning and control of power system.

CO2 Analyze the load forecasting of power generation and understood the need of unit commitment and economic dispatch of the generating units with loss and without loss case.

CO3 Analyze the mathematical model of single area and two area system for load frequency control of static and dynamic analysis.

CO4 Identify the relation of voltage and reactive power in power system and analyzed the various methods to improve the voltage profile by modeling of exciter.

CO5 Analyze the operation of SCADA and EMS for monitor and controlling the power system.

TEXT BOOKS

1. O.I.Elgerd - Electrical Energy System Theory : An introduction - Tata McGraw

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Hill Publication,2003 second Edition.

2. PrabhaKundur - Power System stability and control - EPRI Series - McGraw Hill Inc., 2004.

REFERENCE BOOKS

1. PSR Moorthy - Power System Operation & Control, Tata McGraw Hill publication,1992
2. Dr S Mukhopadhyaya - Modern power system control and operation, Roorkee PublishingHouse, Roorkee, 1983Edition
3. HadiSaadat, Power system analysis, WCB, McGraw Hill International Edition, 2002

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														1
CO2	3				1								1		
CO3	2	2													
CO4	2	2													2
CO5	2	2													

718EET02 **ELECTRIC DRIVES AND CONTROL**

L	T	P	C
3	0	0	3

PREREQUISITE : Electrical Machines and Power Electronics

COURSE OBJECTIVES

- Types of drives, Characteristics of Drive motors, Dynamics of electric drives and selection of power rating for drive motors.
- Converter fed DC drives and Chopper fed DC drives.
- V/f control, Inverter fed Induction motor drive and Vector Controlled Induction motor drives.
- Inverter fed Synchronous motor drive, Brushless DC motor drive.
- Digital techniques in speed control and applications of drive motors.

UNIT I CHARACTERISTICS OF ELECTRIC DRIVES 9

Electric drives: introduction, types, advantage, choice. Speed - Torque characteristics of various types of drive motors- Dynamics of electric drives-Selection of power rating for drive motors with regard to thermal overloading- load variation factors - Classes of duty and selection of motor-load equalization - Starting, braking, and reversing operations.

UNIT II DC DRIVES 9

Speed control of DC motors - Thyristor converter fed dc drives: - Single, two and four quadrant operations -Chopper fed DC drives : Time ratio control and current limit control - Single, two and four quadrant operations-Applications of DC drives - Effect of ripples on the motor performance.

UNIT III THREE PHASE INDUCTION MOTOR DRIVES 9

Speed control of three phase Induction Motors - Stator control: Stator voltage and frequency control ,V/f control - AC chopper, Inverter fed Induction Motor drives, Rotor control - Rotor resistance control and slip power recovery schemes - Static Kramer and Scherbius drives-Applications of Induction motor drives - Introduction to Vector Controlled Induction Motor Drives.

UNIT IV THREE PHASE SYNCHRONOUS MOTOR DRIVES 9

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Speed control of three phase Synchronous Motors - True synchronous and self-controlled modes of operation- Inverter fed Synchronous Motors – cyclo converter fed Synchronous Motor-BLDC motor drive – PMSM Drive - Applications of Synchronous motor drives-Effect of harmonics on the performance of ACmotors.

UNIT V DIGITAL CONTROL AND DRIVE APPLICATIONS 9

Speed control of Motor using Digital techniques: Microprocessor/ Microcontroller based separately excited dc motor drive - Microcontroller based induction motor Drive - PLC based control ofdrives - Selection of drives and control schemes for Steel rolling mills-Paper mills-Lifts and Cranes.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Classify the types of drives, analyze the Characteristics of Drive motors and Dynamics of electric drives, estimate the power rating for drive motors.

CO2 Demonstrate the Converter fed DC drives and Chopper fed DC drives.

CO3 Recognize the V/f control, Inverter fed Induction motor drive and Vector controlled Induction motor drives.

CO4 Demonstrate the Inverter fed Synchronous motor drive, Brushless DC motor drive.

CO5 Categorize the Digital techniques in Speed control and identify the applications of drive motors.

TEXT BOOKS

1. Gopal K Dubey., “Fundamentals of Electrical Drives", Second Edition, Narosa Publishing House, NewDelhi, Reprint 2020.
2. VedamSubramanyam, “Electric Drives: Concepts and Applications”, Second Edition, Tata McGraw hillPvt. Ltd, New Delhi, 2011.

REFERENCE BOOKS

1. Ion Boldea and S. A. Nasar”, Electric Drives”, Third Edition, CRC Press LLC, New York, 2016
2. M.H.Rashid, „Power Electronics: Circuits, Devices and Application‟, Fourth Edition, Pearson, Education of India, 2014.
3. Krishnan R, “Electric Motor Drives: Modeling, Analysis and Control”, Prentice Hall of India, Pvt. Ltd,New Delhi, 2010.
4. Bose, B.K., "Power Electronics and Variable frequency Drives – Technology and Applications", IEEE, Press, Inc. New York, 1997.
5. Bose, B.K., “Modern Power Electronics and AC Drives", Pearson Education (Singapore) Pvt.. Ltd, New Delhi, 2005

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3												2		2
CO2	1	3											3		
CO3		3	3										3		2
CO4			3										2		
CO5		2	2		2				3				3	1	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

718EET03	SPECIAL ELECTRICAL MACHINES	L	T	P	C
		3	0	0	3

PREREQUISITE : Microprocessors and Micro controllers, Electrical Machines- I&II

COURSE OBJECTIVES

- Construction, principle of operation and performance of permanent magnet synchronous motors.
- Construction, principle of operation and performance of permanent magnet brushless D.C motors and synchronous reluctance motors.
- Construction, principle of operation and performance of synchronous reluctance motors.
- Construction, principle of operation and performance of switched reluctance motors.
- Construction, principle of operation and performance of stepping motors.

UNIT I PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Constructional details – Classifications – Principle of operation – EMF equations - Torque equations – Synchronous Reactance – Power controllers - Converter volt- ampere requirements – circle diagram - torque / speed characteristics - Microprocessor based control. Slotless motors- Applications.

UNIT II PERMANENT MAGNET BRUSHLESS D.C MOTORS 9

Necessity for brushless DC motor- Principle of operation – Types-Three phase unipolar and bipolar driven motors-Rotor position sensors- construction of Commutator– EMF equations- Torque equations – Power controllers – torque /speed characteristics – Applications

UNIT III SYNCHRONOUS RELUCTANCE MOTORS 9

Constructional features – Types –Rotor design: Axially laminated type, Radially laminated type- Principle of operation – Reluctance – Phasor diagram - torque /speed characteristics- Vernier motor-constructional features,working principle – Applications.

UNIT IV SWITCHED RELUCTANCE MOTORS 9

Constructional features – Principle of operation– phases winding- static torque production – Converter circuits-Control circuits: Hysteresis type current regulator, Voltage pulse width modulation type regulation-Torque / speed characteristics -Microprocessor based control- Applications.

UNIT V STEPPING MOTORS 9

Constructional features – Principle of operation – Variable reluctance motor – Hybrid motor – Applications of stepper motor- Torque equations —dynamic characteristics: Pull in curve, Pull out curve– Drive system and circuits of Stepper motor – Closed loop control of Stepper motor.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Classify and explain the working of PMSM.

CO2 Apply control techniques to permanent magnet brushless DC motors.

CO3 Analyze the performance of switched reluctance motor and synchronous reluctance motor.

CO4 Analyze the performance of synchronous reluctance motor.

CO5 Categorize the stepping motors and analyze their performance.

TEXT BOOKS

1. T.J.E. Miller, „Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, Oct 20, 2016.
2. T.Kenjo, Stepping motors and their microprocessor controls, Oxford University press, NewDelhi, 12 Aug 2018.
3. K.Venkataratnam, Special Electrical Machines, Universities Press, 2014

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

REFERENCE BOOKS

1. P.P. Aearnley, „Stepping Motors ,A Guide to Motor Theory and Practice', Peter Perengrinus, London, Nov 26, 2018.
2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London,26 Nov 2018.
3. R.Srinivasan, „Special Electrical Machines', Lakshmi Publications, 2013.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1	2		1		2										
CO2	3		2		2				1					1	
CO3	1						2			2			2		1
CO4		1			2										
CO5	3			1									2		

718EET04 **POWER QUALITY MANAGEMENT** **L T P C**

3 0 0 3

PREREQUISITE : Nil

COURSE OBJECTIVES

- To understand the various power quality issues.
- To understand the concept of power and power factor in single phase and three phase system supplying non linear loads.
- To understand the conventional compensation techniques used for power factor correction and load voltage regulation.
- To understand the active compensation techniques used for power factor correction.
- To understand the active compensation techniques used for load voltage regulation.

UNIT I INTRODUCTION **9**

Power quality, Voltage Equality–Power quality issues: Short and Long duration voltage variations, Transients, Waveform distortion, Voltage imbalance, Voltage fluctuation, Power frequency variations, low power factor–Sources and Effects of power quality problems–Power quality and Electro Magnetic Compatibility(EMC)Standards.

UNIT II SHORT INTERRUPTIONS & LONG INTERRUPTIONS **9**

Origin of short interruptions–Monitoring of short interruptions– Influence on induction motors, Synchronous motors, Adjustable speed drives, Electronic equipment's-Single phase tripping: Voltage during fault and post fault period, Current during fault period– Failure, Outage, Interruption—Causes of long interruptions–Principles of regulating the voltage Voltage regulating devices, Applications: Utility side, End- User side–Reliability evaluation– Cost of interruptions.

UNIT III VOLTAGE SAG AND TRANSIENTS **9**

Introduction–CausesofVoltageSag–ThreePhaseUnbalance–Phaseanglejumps– Load influence on voltage sags on Adjustable speed drives, Power electronics loads, Sensitive loads- Stochastic assessment of voltage sags- Overview of mitigation methods. Power system transient model–Principlesofovervoltageprotection-Typesandcausesoftransients–Devicesforovervoltageprotection-

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Transients from load switching.

UNIT IV WAVEFORM DISTORTION, WIRING AND GROUNDING 9

Introduction–Harmonics, Harmonics indices, inter harmonics, Notching– Voltage Vs Current distortion– HarmonicsVsTransients–Sourcesandeffectsofharmonicdistortion–System response characteristics– Principles of controlling harmonics-Reasons for grounding– National Electrical Code(NEC)grounding requirements—Wiring and grounding.

UNIT V POWER QUALITY SOLUTIONS 9

Introduction–Need, Evolution, Deregulation of power quality monitoring– Power factor improvement– power quality measurement equipment's and power conditioning equipment's– Planning, Conducting and Analyzing power quality survey–Mitigation and control techniques-Active Filters for Harmonic Reduction.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Study various methods of power quality monitoring and the production of voltages sags.

CO2 Study the interruptions types and its influence in various components.

CO3 Study the effects of harmonics on various equipments.

CO4 Understand the power quality monitoring and classification techniques.

CO5 Understand power quality measurement techniques.

TEXT BOOKS

1. Roger C. Dugan, Mark F.Mc Granagh anand H.WayneBeaty,"Electrical Power Systems Quality",McGraw-Hill,New York,2nd Edition,2002.
2. Barry W.Kennedy,"Power Quality Primer", McGraw-Hill, NewYork, 2000.

REFERENCE BOOKS

1. Sankaran.C,"PowerQuality",CRCPress,Washington,D.C.,2002
2. MathH.J.Bollen, "Understanding PowerQuality Problems:Voltage Sags and Interruptions", IEEEPress,NewYork,2000.
3. Arrillaga.J,Watson.N.RandChen.S,"Power System Quality Assessment", JohnWiley &SonsLtd.,England,2000
4. Short.T.A., "Distribution Reliability and Power Quality", CRC Press Taylor and FrancisGroup,2006.T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors',Clarendon Press, London,26 Nov 2018.
5. R.Srinivasan, „Special Electrical Machines', Lakshmi Publications, 2013.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2		1		2										
CO2	3		2		2				1					1	
CO3	1						2			2			2		1
CO4		1			2										
CO5	2	2				2									

718EEP07 POWER SYSTEM SIMULATION LABORATORY

L	T	P	C
0	0	2	1

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

PREREQUISITE : Electrical and Electronics Circuits Simulation Lab

COURSE OBJECTIVES

- To be familiar with the simulation power system analysis

LIST OF EXPERIMENTS

1. Compensation of parameters and modeling of transmission lines
2. Formation of Bus Admittance and Impedance matrices.
3. Power Flow Analysis using Gauss –Seidel Method.
4. Power Flow Analysis using Newton Raphson Method.
5. Fault Analysis
6. Load-Frequency Dynamics of Single Area Power Systems
7. Load-Frequency Dynamics of Two Area Power Systems
8. Economic Dispatch in Power Systems with loss
9. Economic Dispatch in Power Systems without loss
10. Electromagnetic Transients in Power Systems

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Acquire experience in the usage of standard packages for the following analysis/simulation/control functions.

CO2 Develop computer programs to perform load flow analysis on the power systems.

CO3 Compute and model the transmission lines and analyze the generation control in power system using simulation tools.

CO4 Solve the transient stability problem in single machine infinite bus system.

CO5 Analyse Electromagnetic Transients in Power systems.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3													1	
CO2	3	2	1										1		2
CO3	3	2	2										2	2	
CO4	3	2	1										2	2	2
CO5	2	1			2								2	1	

718EEP08 **ELECTRIC DRIVES LABORATORY**

L	T	P	C
0	0	2	1

PREREQUISITE: Electrical and Electronics Circuits Simulation Lab.

COURSE OBJECTIVES

- Software tools used for simulation of drives.
- Simulation of Single phase, three phase converter fed DC motor drive and Chopper fed DC

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

motor drive.

- Simulation of VSI and PWM Inverter fed induction motor drive.
- Simulation of BLDC motor and Switched reluctance motor drive.
- Simulation of Stepper motor drive and synchronous motor drive.

LIST OF EXPERIMENTS

Simulation of

1. Closed loop control of converter fed DC motor
2. Closed loop control of chopper fed DC motor
3. Single phase full controlled bridge rectifier fed separately excited DC motor
4. Single phase semi controlled bridge rectifier fed separately excited DC motor
5. Three phase rectifier fed DC motor.
6. VSI fed 3ϕ induction motor
7. Switched reluctance motor drive
8. 3ϕ synchronous motor drive

Hardware of

1. Closed Loop PWM Inverter Fed IM Drive
2. Closed Loop Control of PMSM By V/F/ Method
3. Speed control of BLDC motor
4. Stepper motor drive

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Demonstrate the software tools used for simulation of drives.

CO2 Design and apply the speed control of Single Phase, three phase converter fed DC motor drive and Chopper fed DC motor drive.

CO3 Design and apply the speed control of VSI and PWM Inverter fed induction motor drive.

CO4 Design and apply of BLDC motor and Switched reluctance motor drive.

CO5 Design and apply of Stepper motor drive and synchronous motor drive.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	3	2	2		2							2	2		
CO3		3	2	2									2		
CO4			3	3	3				2		2	2	2	2	1
CO5			3	3	3				2		2	2	2	3	2

718EEP09 **MINI PROJECT WORK** **L T P C**

0 0 2 1

OBJECTIVES

To enable the students to do a project involving some design and fabrication work.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Every project work shall have a Guide who is a member of the faculty. Four periods per week shall be allotted in the time table for this important activity and this timeshall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis, or field work as assigned by the Guide and also to present in periodical seminars or viva to review the progress made in the mini project.

Each student shall finally produce a comprehensive report covering background information, literature– survey, problem statement, project work details, estimation of cost and conclusions. This final report shall be in type written form as specified in the guidelines.

The continuous assessment and semester evaluation is to be carried out as specified in theguidelines to be issued from time to time.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Do the identification of real time problems.

CO2 Have awareness of design methodologies & its implementation.

CO3 Implement advance simulation software techniques.

CO4 Produce a comprehensive report covering background information, literature surveey .

CO5 Produce a comprehensive report covering problem statement, project work details and conclusion.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1							2								
CO2										2		2	3	2	
CO3						3									
CO4								2							2
CO5								2							2

PROFESSIONAL ELECTIVE-V

		L	T	P	C
718EEE05	**FLEXIBLE AC TRANSMISSION SYSTEMS**	**3**	**0**	**0**	**3**

PREREQUISITE : Power Electronics, Transmission and Distribution

COURSE OBJECTIVES

- To introduce the reactive power control techniques.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

- To educate on static VAR compensators and their applications.
- To provide knowledge on Thyristor controlled series capacitors.
- To educate on STATCOM devices.
- To provide knowledge on advanced FACTS controllers.

UNIT I INTRODUCTION 9

Reactive power control Line Electrical power transmission lines-Uncompensated transmission line - series compensation–Basic concepts of Static Var Compensator (SVC), Thyristor Controlled Series capacitor(TCSC), Unified power low controller(UPFC).

UNIT II STATIC VAR COMPENSATOR AND APPLICATIONS 9

Voltage control by SVC–Advantages of slope in dynamic characteristics–Influence of SVC on system voltage–Design of SVC voltage regulator–Modelling of SVC for power flow and fast Transient stability– Applications: Enhancement of transient stability–Steady state power transfer–Enhancement of power system damping.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR AND APPLICATIONS 9

Operation of the TCSC–Different modes of operation–Modelling of TCSC–Variablereactance model Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit–Enhancement of system damping.

UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS 9

Static Synchronous Compensator (STATCOM)–Principle of operation–V- I Characteristics. Applications: Steady state power transfer-enhancement of transient stability–prevention of voltage instability. SSSC-operation of SSSC and the control of power flow–modelling of SSSC in load flow and transient stability studies

UNIT V ADVANCED FACTS CONTROLLERS 9

Interline DVR(IDVR) - Unified Power flow controller (UPFC) - Interline power flow controller(IPFC) - Unified Power quality conditioner (UPQC).

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will have:

CO1 Ability to acquire knowledge on facts devices.

CO2 Ability to understand, analyze and develop analytical model of FACTS controller for power system application.

CO3 Ability to understand the concepts about load compensation techniques.

CO4 Ability to analyze the performance of steady state and transients of FACTS controllers.

CO5 Ability to study about advanced FACTS controllers.

TEXT BOOKS

1. R.MohanMathur,RajivK.Varma,"Thyristor–BasedFactsControllersforElectrical Transmission Systems", IEEE press and Wiley India Pvt Ltd, 2011
2. NarainG. Hingorani,"Understanding FACTS-Concepts and Technology of Flexible AC Transmission Systems",StandardPublishersDistributors,Delhi-110006,2011
3. K.R.Padiyar,"FACTS Controllers in Power Transmission and Distribution",NewAge International(P)Limited,Publishers,NewDelhi,2009.

REFERENCE BOOKS

1. A.T.John,"Flexible A.C. Transmission Systems", Institution of Electrical andElectronic Engineers(IEEE),1999.
2. V.K.Sood, HVDCandFACTScontrollers–ApplicationsofStaticConvertersinPowerSystem,Springer, 2013.
3. Xiao–Ping Zang, Christian Rehtanzand Bikash Pal, "Flexible AC Transmission System:

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Modelling and Control" Springer,2012

	Programme Outcomes												Programme Specific Outcomes		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2											2		
CO2	3	2	2								2		2		
CO3		3	2	2									2		2
CO4			3	3				2		2	2		2	2	3
CO5			3	3				2		2	2		2	3	

718EEE06 **EMBEDED SYSTEMS**

L	**T**	**P**	**C**
3	**0**	**0**	**3**

PREREQUISITE : Nil

COURSE OBJECTIVES

- Building Blocks of Embedded System.
- Introduction to Embedded Software Tools.
- Bus Communication protocol, Input/output interfacing.
- Various scheduling concepts for process & basics of Real time operating system.
- Discuss through Phase of development of embedded products.

UNIT I INTRODUTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems – Structural units in Embedded processor, selection of processor &memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock-In Circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols -RS232 standard - RS42 - RS485 – CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C)-need for device drivers.

UNIT III WARE EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle – Objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software, co-design, Data Flow Graph, state machine model, sequential Program Model, concurrent model, object oriented model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Pre-emptive and non-pre-emptive scheduling, Task communication- shared memory, message passing-, Inter process Communication – synchronization between processes- semaphores, Mailbox, pipes, priority inversion, priority inheritance.

UNIT V EMBEDDED SYSTEM APPLICATION WITH DEVELOPMENT 9

Case Study: Washing Machine- Automotive Application-Smart Card System Application-ATM Machine-Digital Camera.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

CO1 Understand the concept of embedded systems.

CO2 Analyze of embedded networking to interface with the communication protocols.

CO3 Analyze the design process for embedded systems.

CO4 Create models for various applications using embedded concept.

CO5 Design using embedded systems for real time applications.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Rajkamal, „Embeddedsystem-Architecture,Programming, Design‟,TMH,3rd Edition,2017.
2. Peckol, “Embedded system Design”,JohnWiley&Sons,2011.

REFERENCE BOOKS

1. Shibu.K.V, “Introduction to Embedded Systems”, Tata McGraw Hill, 2nd Edition, 2017.
2. LyaB. Das,” Embedded Systems”,Pearson Education,2012.
3. Dave, “Embedded Systems: Concepts Design and Programming,1stedition, Pearson Education, 2015.
4. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2nd Edition, 2012.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											1		
CO2	3	2			2								1	2	1
CO3	3	2	1		2								1	2	
CO4	3	2	1										3	2	1
CO5	2	2			1				3			2	2		

718EEE07 **SMART GRID**

L	T	P	C
3	0	0	3

PREREQUISITE : Nil

COURSE OBJECTIVES

- To study about smart grid technologies, different smart meters and advance metering Infrastructure.
- To familiarize the power quality management issues in smart grid.
- To familiarize the high performance computing for smart grid applications.

UNIT I INTRODUCTION TO SMART GRID **9**

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid

UNIT II SMART GRID TECHNOLOGIES **9**

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

UNIT III T METERS AND ADVANCED METERING INFRASTRUCTURE 9

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI Protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU), Intelligent Electronic Devices (IED) – application of PMU and IED for monitoring & protection.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID 9

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit-case studies.

UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS 9

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadbandover Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing in smart grid, Cyber Security for Smart Grid.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Develop more understanding on the concepts of Smart Grid and its present Developments.

CO2 Study about different Smart Grid technologies.

CO3 Acquire knowledge about different smart meters and advanced metering Infrastructure.

CO4 Have knowledge on power quality management in Smart Grids.

CO5 Develop more understanding on LAN, WAN and Cloud computing for Smart Grid Applications.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Stuart Borlase “Smart Grid: Infrastructure, Technology and Solutions”, CRC Press 2012..
2. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama,“SmartGrid: Technology and Applications”, Wiley 2012.

REFERENCE BOOKS

1. Vehbi C. Güngör, DilanSahin, TaskinKocak, SalihErgüt, ConcettinaBuccella, Carlo Cecati,and Gerhard P. Hancke, “Smart Grid Technologies: Communication Technologies and Standards” IEEE Transactions On Industrial Informatics, Vol. 7, No. 4, November 2011.
2. Xi Fang, SatyajayantMisra, GuoliangXue, and Dejun Yang “Smart Grid – The New and Improved Power Grid: A Survey” , IEEE Transaction on Smart Grids, vol. 14, 2012.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2													
CO2	2	3	3										3		

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

CO3	2	3	3									3		
CO4	2	3	3									3		
CO5					3							2	3	2

718EEE08 **MODERN POWER CONVERTERS**

L	T	P	C
3	0	0	3

PREREQUISITE : Power Electronics

COURSE OBJECTIVES

- Understood the operation of Switched mode dc power supplies.
- Learnt about the AC-DC converters.
- Learnt about the DC-AC converters.
- Learnt about the AC-AC converters.
- Understood the operation of soft-switching power converters

UNIT I **SWITCHED MODE POWER SUPPLIES (SMPS)** **9**

DC Power supplies and Classification; Switched mode dc power supplies - with and without isolation, single and multiple outputs; Closed loop control and regulation; Design examples on converter and closed loop performance.

UNIT II **AC-DC CONVERTERS** **9**

Switched mode AC-DC converters. synchronous rectification - single and three phase topologies - switching techniques - high input power factor . reduced input current harmonic distortion-improvedefficiency with and without input-output isolation. performance indices design examples

UNIT III **DC-AC CONVERTERS** **9**

Multi-level Inversion - concept, classification of multilevel inverters, Principle of operation, main features and analysis of Diode clamped, Flying capacitor and cascaded multilevel inverters; Modulation schemes.

UNIT IV **AC-AC CONVERTERS WITH AND WITHOUT DC LINK** **9**

Matrix converters. Basic topology of matrix converter; Commutation – current path; Modulation techniques - scalar modulation, indirect modulation; Matrix converter as only STUCORAPP 95 AC-DC converter; AC-AC converter with DC link - topologies and operation - with and without resonance link - converter with dc link converter; Performance comparison with matrix converter with DC link converters

UNIT V **SOFT-SWITCHING POWER CONVERTERS** **9**

Soft switching techniques. ZVS, ZCS, quasi resonance operation; Performance comparison hard switched and soft switched converters.AC-DC converter, DC-DC converter, DC-AC converter.; Resonant DC power supplies

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Understand the operation of Switched mode dc power supplies.

CO2 Learn about the AC-DC converters.

CO3 Learn about the of DC-AC converters.

CO4 Gain knowledge about AC-AC converters with and without dc link.

CO5 Understand the operation of soft switching power converters.

TOTAL: 45 PERIODS

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

TEXT BOOKS

1. 1. Power Electronics Handbook, M.H.Rashid, Academic press, New ork, 2000.
2. 2. Advanced DC/DC Converters, Fang Lin Luo and Fang Lin Luo, CRC Press, NewYork,2004.
3. Control in Power Electronics- Selected Problem, Marian P.Kazmierkowski, R.KrishnanandFredeBlaabjerg, Academic Press (Elsevier Science), 2002.

REFERENCE BOOKS

1. Power Electronic Circuits, IssaBatarseh, John Wiley and Sons, Inc.2004
2. Power Electronics for Modern Wind Turbines, FredeBlaabjerg and Zhe Chen, Morgan ClaypoolPublishers series, United States of America, 2006.
3. Krein Philip T, Elements of Power Electronics,Oxford University press, 2008
4. Agarwal ,Power Electronics: Converters, Applications, and Design, 3rd edition, Jai P, PrenticeHall,2000
5. L. Umanand, Power Electronics: Essentials & Applications, John Wiley and Sons, 2009.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3													
CO2	3	3													
CO3	3	3													
CO4	3	3	2												2
CO5	2		2		2						2		3	2	

PROFESSIONAL ELECTIVE-VI

		L	T	P	C
718EEE09	**EHVAC POWER TRANSMISSIONS**	**3**	**0**	**0**	**3**

PREREQUISITE :Transmission and Distribution

COURSE OBJECTIVES

- To illustrate concepts of reactive parameters
- To describe about the voltage gradient.
- To illustrate the corona effects.
- To describe about the voltage control in AC transmission.

UNIT I LINE AND GROUND REACTIVE PARAMETERS 9

Necessity of EHV AC transmission – advantages and problems–power handling capacity and line losses- mechanical considerations – resistance of conductors – properties of bundled conductors – bundle spacing and bundle radius- Examples-Line inductance and capacitances – sequence inductances and capacitances.

UNIT II ELECTRO STATIC FIELD AND VOLTAGE GRADIENTS OF CONDUCTORS 9

Electrostatics – field of sphere gap – field of line charges and properties – charge potential relations formulti-conductors – surface voltage gradient on conductors – distribution of voltage gradient on sub conductors of bundle – Examples. Electrostatic field: calculation of electrostatic field of EHV/AC

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

lines.

UNIT III CORONA EFFECTS 9

Power loss and audible noise (AN) – corona loss formulae – charge voltage diagram –generation, characteristics - limits and measurements of AN – relation between 1-phase and 3-phase ANlevels – Examples.

UNIT IV TRAVELING WAVE THEORY 9

Traveling wave expression and solution- source of excitation- terminal conditions- open circuited and short-circuited end- reflection and refraction coefficients-Lumped parameters of distributed linesgeneralized constants.

UNIT V VOLTAGE CONTROL 9

Power circle diagram and its use – voltage control using synchronous condensers – cascade connection of shunt and series compensation – sub synchronous resonance in series capacitor – compensated lines – staticVAR compensating system.-case studies

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Understand the concepts of line parameters and its design.

CO2 Understand effects of corona in transmission system.

CO3 Understand about the voltage control and reactive power compensation.

CO4 Become very conversant and knowledgeable in traveling theory.

CO5 Gain the knowledgeable in voltage control and series & shunt compensation.

TEXT BOOKS

1. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, New Academic Science, Fourth Edition, 2011.
2. E. Kuffel, W. S. Zaengl, J. Kuffel, High Voltage Engineering Fundamentals, Elsevier, 3 rdEdition 2016.
3. TuranGonen: Electric Power Transmission System Engineering Analysis and Design
4. Hugh M. Ryan, High Voltage Engineering and Testing, IEE power and energy series 32, The Institution of Engineering and Technology 2nd edition 2001.
5. Jos Arrillaga: HVDC Transmission, The institution of electrical engineers, IEE power & energyseries 29, 2nd edition 1998.

REFERENCES:

1. A Chakraborti, D.P. Kothari and A.K. Mukhopadyay: Performance, Operation and Controlof EHV Power Transmission Systems, T.M.H, 1999
2. S. Rao, EHVAC,HVDC Transmission & Distribution, Khanna Publishers , Third Edition,2009.
3. K. R. Padiyar : HVDC Power Transmission Systems: Technology and system Interactions,New Age International (P) Limited, and Publishers, 1990

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	3	2											2		2

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO3		3	3	2	2			2		2	2		2		
CO4			3	3	3			3		2	2		2	3	
CO5	3		2		2					2			2	2	

718EEE10 POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS

L	T	P	C
3	0	0	3

PREREQUISITE :Power Electronics

COURSE OBJECTIVES

- To provide knowledge about the stand alone and grid connected renewable energy systems.
- To equip with required skills to derive the criteria for the design of power converters for renewable energy applications.
- To design different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy systems.
- To analyze and comprehend the various operating modes of wind electrical generators and solar energy systems.
- To develop maximum power point tracking algorithms.

UNIT I INTRODUCTION 9

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION 9

Reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG

UNIT III POWER CONVERTERS 9

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection ofinverter, battery sizing, array sizing Wind: Three phase AC voltage controllers- AC-DC- AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS 9

Stand alone operation of fixed and variable speed wind energy conversion systems and solar system- Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integratedsolar system

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS 9

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PVMaximum Power Point Tracking (MPPT).

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Have knowledge about the stand alone and grid connected renewable energy systems.

CO2 Equip with required skills to derive the criteria for the design of power converters for renewable energy applications.

CO3 Design different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy systems.

CO4 Analyze and comprehend the various operating modes of wind electrical generators and

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

solar energy systems.

CO5 Develop maximum power point tracking algorithms.

TEXT BOOKS

1. S. N. Bhadra, D.Kastha, S.Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.
2. B.H.Khan Non-conventional Energy sources Tata McGraw-hill Publishing Company, NewDelhi,2009.

REFERENCES:

1. Rashid .M. H "power electronics Hand book", Academic press, 2001.
2. Ion Boldea, "Variable speed generators", Taylor & Francis group, 2006.
3. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.
4. Gray, L. Johnson, "Wind energy system", prentice hall linc, 1995.
5. Andrzej M. Trzynnadlowski, „Introduction to Modern Power Electronics", Second edition, wiley India Pvt. Ltd, 2012.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2					2									
CO2	3														
CO3	2														
CO4	2				2								1		3
CO5	2	2				2									

718EEE11 AIRCRAFT ELECTRICAL SYSTEMS

L	T	P	C
3	0	0	3

PREREQUISITE :Nil

COURSE OBJECTIVES

- To Study about fundamentals of electricity.
- To familiarize the aircraft motors and generators.
- To familiarize aircraft instruments and design.

UNIT I INTRODUCTION **9**

Introduction, Aircraft Electrical System, Power Generation, Primary Power Distribution, Power Conversion and Energy Storage, Secondary Power Distribution, Electrical Loads, Recent Electrical System Developments.

UNIT II AIRCRAFT GENERATORS AND MOTORS **9**

Generator and motor principles, Ac generators, Three phase generation and distribution, ACmotors, Practical aircraft generating systems, transformers, emergency power.

UNIT III WIRING AND PROTECTION SYSTEMS **9**

Emergency power generation-RAT, PMG. Airbus 380 Electrical system. Warning systems, aircraft lights-lighting technologies, passengers, compartment, exterior lights. overview of cabin systems. stall warning, windscreen and rain protection.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT IV ENGINE SYSTEMS 9

Starting and ignition, indicating systems overview, primary indicating systems, secondary indicating systems, Electronic indicating systems. Batteries-storage cells, lead acid batteries,lithium batteries, battery connections, battery venting.

UNIT V AIRCRAFT INSTRUMENTS 9

Flight instruments and navigation instruments- gyroscope, accelerometer, air speed indicator, TAS, EAS, Mach Meters, Altimeters, Principles and operation, Study of various types of engine instruments, Tachometers, Temperature gauges, Pressure gauges, Operation and Principles.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Distinguish the conventional and modern control systems.

CO2 Classify the aircraft systems.

CO3 Categorize different types of aircraft instruments.

CO4 Have knowledge on aircraft design fundamentals.

CO5 Have knowledge on aircraft protection system.

TEXT BOOKS

1. S Ian Moirand Allan Seabridge, Aircraft Systems: Mechanical, Electrical and Avionics-Subsystem Integration", Wiley India Pvt Ltd, 3rd edition, 2012, ISBN-13: 978-8126535217.
2. Pallet, E.H.J., Aircraft Instruments and Integrated Systems, Longman Scientific and Technical, 1996.

REFERENCES:

1. Lalit Gupta and OP. Sharma, Aircraft Systems (Fundamentals of Flight Vol. IV)",Treager. S, Gas Turbine Technology, McGraw-Hill, 3rd edition,2013, ISBN-13:9781259064876.
2. R.W. Sloley and W.H. Coulthard, The aircraft Engineers Handbook, No 4, Instruments",6 Edition, 2005, ISBN-13: 978-8175980518
3. SR. Majumdar, Pneumatic Systems", Tata McGraw Hill Publishing Co,1st Edition, 2001, ISBN-13: 978-0074602317.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2													
CO2	3	2		2											
CO3	3	2		3											2
CO4	3	2		3											
CO5	2	3		3											3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

718EEE12	ADAPTIVE CONTROL	L	T	P	C
		3	0	0	3

PREREQUISITE :Nil

COURSE OBJECTIVES

- To Study about Adaptive system.
- To understand self tuning regulators.
- To study the model reference adaptive system.
- To understand Gain scheduling

UNIT I INTRODUCTION **9**

Introduction. Block Diagram of an Adaptive System, Effects of Process Variations on System Performance, Types of Adaptive schemes, Formulation of the Adaptive Control Problem, Least squares method and Regression models for parameter estimation, Theorems, Estimating Parameters in Models of Dynamic Systems, The Finite Impulse Response Model, The Transfer Function Model and the Stochastic Model.

UNIT II SELF TUNING REGULATORS **9**

Block Diagram of Deterministic Self Tuning Regulator (STR), Pole Placement Design – ProcessModel, Causality conditions. Indirect STRs-Estimation, Continous – Time STRs, Direct STRs- Minimum Phase systems, Adaptive Control Algorithm, Feed Forward Control, Non-Minimum Phase Systems-Adaptive control algorithm, -Algorithm for Hybrid STR

UNIT III DESIGN & ALGORITHMS **9**

Design of Minimum Varaince and Moving-Average controllers, Stochastic STR- Indirect STR, Algorithm for Basic STR, Theorems on Asymptotic properties. Unification of Direct STRs, Generalized Direct self TuningAlgoritms. Self tuning Feed forward control. Linear Quadratic STR-Theorems on LQG Control, Algorithms for Indirect LQG-STRs Based on spectral factorization and Riccati Equation

UNIT IV MODEL REFERENCE ADAPTIVES SYSTEM **9**

Model Reference Adaptive System (MRAS), The MIT Rule, Block Diagram of an MRAS for adjustmentof feed forward gain based on MIT Rule, Adaptation Gain- Methods for determination. Design of MRASusing Lyapunov Theory- Block diagram of an MRAS based on LyapunovThory for a First Order system. Proof of the Kalman – Yakubovich Lemma, Adjustment Rules for Adaptive Systems, Relation between MRAS and STR

UNIT V GAIN SCHEDULING **9**

Gain scheduling- Principle, Block Diagram, Design of Gain scheduling controllers, non-linear Transformation, Block schematic of a controller based on Non linear Transformations. Application of GainScheduling for ship steering. Flight control, Self Oscillating Adaptive system (SOAS)-Principle, Block Diagram, Properties of the Basic SOAS, Procedure for Design of SOAS, Industrial Adaptive controllers and applications.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Learn various types of adaptive schemes.

CO2 Learn about self-tuning regulators.

CO3 Understand design of minimum variance and moving.

CO4 Understand design of MRAS using Lyapunov Theory.

CO5 Understand Gain scheduling.

TEXT BOOKS

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

1. K.J Astrom and Bjorn Witten mark, Adaptive control, Pearson Edu 2 ndEdition 1994.
2. SankarSastry, Adaptive control, Dover Publications Inc ,2011

REFERENCES:

1. V.V. Chalam, Adaptive control system –Techniques & Applications, Marcel Dekke Inc -1987.
2. Miskhin and Braun, Adaptive control systems, MC Graw Hill 2007.
3. Karl Johan Astrom, Graham Clifford Goodwin, P.R Kumar, Adaptive Control, Filtering and signal processing-1995
4. G.C.Goodwin, Adaptive control -1989

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3					1								1	
CO2	3		1		2							1	2		
CO3	3					1						1	2		3
CO4	3				2	1						1	2		
CO5	3				2	1						1	2		

Semester VIII

		L	T	P	C
818EET01	**ELECTRIC POWER UTILIZATION AND ENERGY AUDITING**	**3**	**0**	**0**	**3**

PREREQUISITE :Power Systems

COURSE OBJECTIVES

- Principle and design of illumination systems and types of lamps.
- Methods of heating welding.
- Electric traction systems and its performance.
- Electrolytic process and storage of electricity.
- Electrical energy conservation, energy auditing and power quality.

UNIT I INTRODUCTION **9**

Introduction to illumination–laws of illumination–Polar curves–lighting calculations- Types of lamps- Design of illumination systems for residential, industrial, commercial and street lightings-Types of lamps-comparison with CFL and LED.

UNIT II ELECTRIC HEATING AND WELDING **9**

Introduction–requirements of an ideal traction system–supply systems–mechanics of train movement – Tractive effort – Specific energy consumption – Traction motors and control– Braking methods – Currentcollection systems – Recent trends in electric traction-Introduction to EMU and metro railways-case study: Indian traction systems.

UNIT III ELECTRIC TRACTION **9**

Introduction–requirements of an ideal traction system–supply systems–mechanics of train movement

– Tractive effort – Specific energy consumption – Traction motors and control– Braking methods –

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

Current collection systems – Recent trends in electric traction-Introduction to EMU and metro railways-

-case study: Indian traction systems.

UNIT IV ELECTROLYTIC PROCESS AND STORAGE OF ELECTRICITY 9

Electrolysis–Polarization factor– Preparation of work for electroplating – tanks and other equipment – Method of charging and maintenance – Nickel iron, Nickel-cadmium and Lithium ion batteries– components and materials– rating and state of charge of batteries –battery charging methods.

UNIT V ENERGY CONSERVATION 9

Cost of electrical energy–Tariff –need for electrical Energy Conservation - methods – Energy efficient equipment – Energy Management – Energy Auditing–case studies. Economics of power factor improvement – Design for improvement of power factor using power capacitors–Power Quality– Effect ofenergy conservation.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Illustrate the principle and design of illumination systems.

CO2 Categorize the heating and welding methods.

CO3 Attain the knowledge about Electric traction systems and its performance.

CO4 Acquire knowledge in Electrolytic process Electroplating and storage of electricity.

CO5 Recognize the needs of energy conservation and conservation techniques, power factor improvement and energy auditing.

TEXT BOOKS

1. C.L. Wadhwa, "Generation Distribution and Utilization Of Electrical Energy "New Age International Publishers; Third edition, 2017.
2. S.L. Uppal, "Electrical Power", Khanna Publishers, 15th edition,2014.

REFERENCE BOOKS

1. J.B. Gupta," Utilization of Electrical Energy and traction", S.K. Kataria & sonsPublications, 2012.
2. Thumann , Albert; Niehus, Terry; Younger, William J, "Hand Book of Energy Audits", RiverPublishers, 9th edition,2013.
3. E. Openshaw Taylor, "Utilization of Electrical Energy in SI Units" Orient Longman Private Limited,2003

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3														1
CO2	3				1								1		
CO3	2	2													
CO4	2	2													2
CO5	2	2													

818EEP04 PROJECT WORK

L	T	P	C
0	0	12	6

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

OBJECTIVES

To enable the students to do a project involving some design and fabrication work.

Every project work shall have a Guide who is a member of the faculty. Four periods per week shall be allotted in the time table for this important activity and this timeshall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis, or field work as assigned by the Guide and also to present in periodical seminars or viva to review the progress made in the mini project.

Each student shall finally produce a comprehensive report covering background information, literature– survey, problem statement, project work details, estimation of cost and conclusions. This final report shall be in type written form as specified in the guidelines.

The continuous assessment and semester evaluation is to be carried out as specified in theguidelines to be issued from time to time.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Identify of real time problems.

CO2 Have knowledge about new technologies.

CO3 Aware of design methodologies and its implementation.

CO4 Implement advanced simulation software techniques.

CO5 Produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO1 2	PSO1	PSO2	PSO3
CO1							2								
CO2										2		2	3	2	
CO3						3									
CO4								2							2
CO5								2							2

PROFESSIONAL ELECTIVE-VII

		L	T	P	C
818EEE02	**DISASTER MANAGEMENT**	**3**	**0**	**0**	**3**

PREREQUISITE : Nil

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

COURSE OBJECTIVES

- To identify and understand different disasters.
- To study the methods on management of disaster.
- To study the role of data bases in disaster management, public awareness in risk reduction, planning in disaster management.
- To learn the strategies of India in disaster management.
- To study the effects of earthquakes and Tsunami.

UNIT I INTRODUCTION 9

Definition: Disaster, Hazard, Vulnerability, Risks – Disasters: Types of disasters – Causes-Impacts including social, economic, political, environmental, health, etc. Disaster preparedness – Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Principle of risk partnership- Disaster and development: Development plans and disaster management.

UNIT II APPLICATION OF TECHNOLOGY IN DISASTER RISK REDUCTION 9

Application of various technologies: Data bases – RDBMS – Management Information systems and other systems – Simulation Modeling and Scenario Analysis- Geographic information systems – Hazard Map and Vulnerability Atlas- Intranets and extranets – Early Warning Systems- Video teleconferencing – Remote sensing: an insight – Contribution of remote sensing and GIS.

UNIT III AWARENESS FOR RISK REDUCTION 9

Trigger mechanism – Constitution of trigger mechanism – Role of Media in disaster preparedness - Risk reduction by education: role of schools and school children – Risk reduction by public awareness: community awareness programmes.

UNIT IV DISASTER MANAGEMENT IN INDIA 9

Disaster Management Act 2005, India's disaster proneness- India's strands in disaster management programme- Cyclone warning and forecasting systems in India: organization, cyclone tracking and advisories, preparation of forecasts, dissemination of cyclone warnings- Challenges to Disaster management.

UNIT V SEISMICITY 9

Seismic waves – Earthquakes and faults – measures of an earthquake, magnitude and intensity – Ground Damage -Tsunamis and earthquakes- Case study: effects of 2004 Tsunami in Tamilnadu coastal areas.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Aware of various natural and men-made disasters.

CO2 Prepare for facing disasters.

CO3 Aware of modern technology and tools in risk reduction.

CO4 Plan in emergency situations.

CO5 Aware of Tsunami and Recovery operations in Tamilnadu.

TEXT BOOKS

1. Pardeep Sahni, Madhavi Malalgoda Ariyabandu, "Disaster Risk Reduction in South Asia",PHI Learning Private Limited, 2010.
2. Amita Sinvhal, "Understanding Earthquake Disasters" TMH, 2010.

REFERENCE BOOKS

1. Pardeep Sahni, Alka Dhameja and Uma Medury, "Disaster Mitigation: Experiences andReflections", PHI Learning Private Limited, 2012
2. Jagbir Singh, "Disaster Management: Future Challenges and Opportunities", I.K. International Publishing House Private Limited, 2007.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3														
CO2	3				1								1		2
CO3	2	2													2
CO4	2	2													
CO5	2	2													

818EEE03 **ELECTRIC VEHICLE TECHNOLOGY** **L T P C**
3 0 0 3

PREREQUISITE : Electric drives and control

COURSE OBJECTIVES

- Electric vehicle classification, Battery charging methods.
- Electric vehicle motors DC, Induction, BLDC and Switched Reluctance motors.
- Electronic devices in EV and sensor-less control methods.
- Types of Hybrid Vehicle.
- Fuel Cells and its Characteristics for Electric Vehicles.

UNIT I INTRODUTION TO ELECTRIC VEHICLES 9

Electric Vehicle – Need - Types – Cost and Emissions – End of life. Electric Vehicle Technology – layouts, cables, components, Control. Batteries – overview and its types. Battery plug-in and life. Ultra-capacitor, Charging – Methods and Standards.

UNIT II ELECTRIC VEHICLE MOTORS 9

Motors – DC, Induction, BLDC – Types, Principle, Construction, Control. Electric Drive Trains (EDT) – Series HEDT (Electrical Coupling) – Power Rating- Peak Power Source (PPS); ParallelHEDT (Mechanical Coupling) – Torque Coupling and Speed Coupling - Switched Reluctance Motors (SRM) Drives.

UNIT III ELECTRONICS AND SENSOR-LESS CONTROL IN EV 9

Sensors - Autonomous EV cars, Self-Drive Cars, Sensor-less Control methods- Phase Flux Linkage-Based Method-Phase Inductance Based-Mutually Induced Voltage Based-Observer Based.

UNIT IV HYBRID VEHICLES 9

Hybrid Electric vehicles – Classification – Micro, Mild, Full, Plug-in, EV. Layout and Architecture – Series, Parallel and Series-Parallel- Hybrid, Propulsion systems and components. Regenerative Braking, Economy, Vibration and Noise reduction.

UNIT V FUEL CELLS FOR ELECTRIC VEHICLES 9

Fuel cell – Introduction, Technologies & Types. Operation principles, Potential and I-V curve, Fuel Cell based energy storage, Fuel cell Characteristics – Efficiency, Durability, Specific power, Factors affecting- Power design of fuel Cell Vehicle.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Categorize the electric vehicles and battery charging.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO2 Recognize the applications of electric vehicle motors.

CO3 Acquire the knowledge of electronic devices in EV and sensor-less control methods.

CO4 Categorize the hybrid vehicles.

CO5 Attain the knowledge in principles Fuel Cells and its characteristics for Electric Vehicles.

TOTAL: 45 PERIODS

TEXT BOOKS

1. EHSANI ,Modern Electric, Hybrid Electric, and Fuel Cell Vehicles , CRC Press, Third edition ,January 2019.
2. Per Enge , Nick Enge , Stephen Zoepf , Electric Vehicle Engineering (ELECTRONICS) ,McGraw-Hill Education 19 January 2021.
3. Febin Daya J. L., Mohan Krishna, Sheldon S. Williamson, Uma shankar Subramaniam, Electric Vehicles and the Future of Energy Efficient Transportation, IGI Global ,2021.

REFERENCE BOOKS

1. A.K. Babu, Electric & Hybrid Vehicles, first edition, Khanna Publishing, 2019.
2. Michael Nikowitz, Advanced Hybrid and Electric Vehicles: System Optimization and Vehicle Integration, first edition, Springer, 2016.
3. RuiXiong, Weixian Shen, Advanced Battery Management Technologies For Electric Vehicles, first edition ,Wiley publication, 2019.

	Programme Outcomes												Programme Specific Outcomes		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2											1		
CO2	3	3	1		2				2				2	2	3
CO3	3	2											2	2	
CO4	3	2											2	2	
CO5	3	1												2	

818EEE04 **TOTAL QUALITY MANAGEMENT**

L	T	P	C
3	0	0	3

PREREQUISITE : Nil

COURSE OBJECTIVES

- To facilitate the understanding of Quality Management principles and process.
- To train them with various tools and techniques of Quality Management.
- To include the importance of Quality in an organization.
- To make understood about the ISO Quality systems
- To make the ward aware of the quality concepts adopted in industry scenario

UNIT I INTRODUCTION **9**

Introduction – Need for quality – Evolution of quality – Definitions of quality – Dimensions of product and service quality – Basic concepts of TQM – TQM Framework – Contributions of Deming, Juran and Crosby – Barriers to TQM – Customer focus – Customer orientation, Customer

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

satisfaction, Customer complaints, Customer retention.

UNIT II TQM PRINCIPLES 9

Leadership – Quality Statements, Strategic quality planning, Quality Councils – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal – Continuous process improvement – PDCA cycle, 5S, Kaizen – Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES- I 9

The seven traditional tools of quality – New management tools – Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES-II 9

Quality Circles – Cost of Quality – Quality Function Deployment (QFD) – Taguchi quality lossfunction – TPM – Concepts, improvement needs – Performance measures.

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000– ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration- ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001— Requirements of ISO 14001—Benefits of EMS.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Describe the dimensional barrier regarding Quality.

CO2 Summarize the Total Quality Principles.

CO3 Demonstrate the tools utilization for quality improvement.

CO4 Analyze the various types of techniques are used to measure quality.

CO5 Apply the various quality system in implementation of Total Quality Management.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, —Total Quality Management, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

REFERENCE BOOKS

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”,8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, 3rdEdition, 2003.
3. Janakiraman. B and Gopal .R.K., “Total Quality Management – Text and Cases”,Prentice Hall (India) Pvt. Ltd., 2006.
4. Suganthi.L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt.Ltd., 2006.
5. ISO9001-2015 standards.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO1	PSO2	PSO3

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

CO1	3														
CO2	3		3												2
CO3	3				3						2				
CO4	3			3											
CO5	3														2

818EEE05 **INDUSTRIAL AUTOMATION**

L	**T**	**P**	**C**
3	**1**	**0**	**4**

PREREQUISITE : Measurements & Instruments

COURSE OBJECTIVES

- To Introduction concept of PLC, DCS and SCADA.
- To study about types of transmitters, control elements and actuators.
- To familiarize students on programming of PLC with typical case studies.
- To study about various subsystems of DCS.
- To study about roll of computers in Automation.

UNIT I INTRODUTION **9**

Need for automation Systems-Architecture of industrial automation system. Introduction toPLC, SCADA and DCS-Introduction to Data Networks: Foundation field bus and profibus.

UNIT II FIELD DEVICES **9**

Conventional / Smart Process Transmitters- Temperature, Pressure, Flow, Level and Ph Measurement - Final Control Elements: - Actuators: Pneumatic and electric actuators – Control Valves - Thyristor Power Controller. Introduction to DC and AC Servo Drives for motion control – Interfacing Field devices with I/O Sub Systems.

UNIT III COMPUTER AIDED MEASUREMENT AND CONTROL SYSTEMS **9**

Role of computers in measurement and control - Elements of computer aided measurement and control: - Human-Machine interface, computer aided process control hardware and software – IndustrialInternet of things-cyber security for industrial automation.

UNIT IV BASIC OF PLC PROGRAMMING (LADDER) **9**

Basics of PLC Programming- Ladder Logic-Relay type instructions- Timer / counter instructions- Programme Control instructions- Data Manipulation and Math instructions- Case studies: - Bottle filling application and Elevator control.

UNIT V DISTRIBUTED CONTROL SYSTEM **9**

DCS: - LCU-Shared communication facility- Display Hierarchy- High Level and Low Levelinterfaces - Case studies: DCS in cement plant and thermal power plant.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Gain knowledge on basics of Industrial Automation.

CO2 Develop Ladder Programmes for PLC.

CO3 Recommend right choice of automation systems for a given application.

CO4 Gain knowledge in design of various automation sensors.

CO5 Apply DCS in power plants.

TOTAL: 45 PERIODS

TEXT BOOKS

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

1. Petruzella,F.D., “Programmable Logic Controllers”, 3rd Edition, Tata McGraw- Hill, 2010
2. C D Johnson “Process control instrumentation technology”Prentise hall India 8th Edition 2007
3. E.A.Parr,Newnes,New Delhi “Industrial control Handbook”,3rd Edition 2005
4. Lucas M.P.,”Distributed Control System”, an Nostrand Reinhold company, New York 1986.

REFERENCE BOOKS

1. Gary Dunning Thomson Delmar, “Programmable logic controller, ceaneage Learning ,3rd Edition2005
2. S.K.SINGH “Industrial Instrumentation” Tata McGraw hill 3rd Edition companies 2011.
3. Rajput R.K.,“ Robotics and Industrial Automation”, S. Chand, Second Revised Edition 2014.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3													1	2
CO2	3	2	1										1		
CO3	3	2	2										2	2	2
CO4	3	2	1										2	2	
CO5	2	1			2								2	1	

PROFESSIONAL ELECTIVE-VI

		L	T	P	C
818EEE06	**POWER SYSTEM DYNAMICS**	**3**	**0**	**0**	**3**

PREREQUISITE :Nil

COURSE OBJECTIVES

- To introduce the basics of dynamics and stability problems.
- To educate on modeling of synchronous machines.
- To educate on the excitation system and speed-governing controllers.
- To study small signal stability of a single-machine infinite bus system with excitation system and power system stabilizer.
- To educate on the transient stability simulation of multi machine power system.

UNIT I INTRODUCTION 9

Basics of system dynamics – numerical techniques – introduction to power system stability problem. Concept and importance of power system stability in the operation and design- distinction between transient and dynamic stability - complexity of stability problem in large system – necessity for reduced models - stability of interconnected systems.

UNIT II SYNCHRONOUS MACHINE MODELLING 9

Synchronous machine –Concept of saliency- flux linkage equations - Park’s transformation - per unit conversion - normalizing the equations - equivalent circuit - current space model - flux linkage state space model. Sub-transient and transient inductances - time constants- Simplified models (one axis and constant flux linkage) - steady state equations and phasor diagrams.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

UNIT III MACHINE CONTROLLERS 9

Need of excitation and its requirements -Exciter and voltage regulators - function and types of excitation systems - typical excitation system configuration - block diagram and state space representation of IEEE type 1 excitation system - saturation function - stabilizing circuit. Function of speed governing systems - block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

UNIT IV TRANSIENT STABILITY 9

State equation for multi machine system with one axis model and simulation – modelling of multi machine power system with one axis machine model including excitation system and speed governing system and simulation using R-K method of fourth order (Gill's technique) for transient stability analysis - power system stabilizer. For all simulations, the algorithm and flow chart have to be discussed

UNIT V DYNAMIC STABILITY 9

System response to small disturbances - linear model of the unregulated synchronous machine and its modes of oscillation - regulated synchronous machine - distribution of power impact - linearization of the load equation for the one machine problem – simplified linear model-effect of excitation on dynamic stability - approximate system representation - supplementary stabilizing signals - dynamic performance measure - small signal performance measures.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Understand the power stability and security problems.

CO2 Understand on basics of dynamic modeling in synchronous machine.

CO3 Understand the needs and modeling of controllers.

CO4 Understand the significance about small signal stability analysis.

CO5 Attain knowledge about stability of dynamic systems.

TEXT BOOKS

1. P.M. Anderson and A.A.Fouad, 'PowerSystem Control and Stability', GalgotiaPublications, New Delhi, 2003..
2. P. Kundur, 'Power System Stability and Control', McGraw Hill Inc., USA, 2006.
3. R.Ramanujam, "Power System Dynamics – Analysis and Simulation", PHI, 2009.

REFERENCES

1. M.A.Pai and W.Sauer, 'Power System Dynamics and Stability', Pearson Education Asia, India, 2002.
2. James A.Momoh, Mohamed. E. EI-Hawary. " Electric Systems, Dynamics and Stability with Artificial Intelligence applications", Marcel Dekker, USA First Edition,2000.
3. C.A.Gross, "Power System Analysis," Wiley India, 2011.
4. B.M.Weedy, B.J.Lory, N.Jenkins, J.B.Ekanayake and G.Strbac," Electric Power Systems", Wiley India, 2013.
5. K.Umarao, "Computer Techniques and Models in Power System," I.K. International,2007.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous)
Dr. M.G.R. Nagar, HOSUR - 635130

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3													1	
CO2	3	2	1										1		
CO3	3	2	2										2	2	2
CO4	3	2	1										2	2	
CO5	2	1			2								2	1	2

818EEE07 **PROFESSIONAL ETHICS AND HUMAN VALUES**

L	T	P	C
3	0	0	3

PREREQUISITE :Nil

COURSE OBJECTIVES

- To create an awareness on Human Values.
- To Analyze the Senses of 'Engineering Ethics'.
- To instill Moral and Social Values and Loyalty.
- To appreciate the rights of others.
- To Analyze the various global issues.

UNIT I HUMAN VALUES **9**

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS **9**

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses ofethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **9**

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the threemile island and chernobyl case studies. Collegiality and loyalty - respect for authority - collectivebargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES **9**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development -Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors -Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the will be able to:

CO1 Create an awareness on Human Values.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO2 Analyze the Senses of 'Engineering Ethics'.

CO3 Instill Moral and Social Values and Loyalty.

CO4 Appreciate the rights of Others.

CO5 Analyze the various global issues.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, NewYork 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hallof India, New Delhi, 2004.

REFERENCES:

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint)
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2						3					2		
CO2	3	2	2		2			3				2	2		2
CO3		3	2	2				3					2		2
CO4			3	3	3			2	2		2	2	2	2	
CO5			3	3	3				2		2	2	2	3	

818EEE08 **INSULATION AND TESTING ENGINEERING**

L	T	P	C
3	0	0	3

PREREQUISITE :High Voltage Engineering

COURSE OBJECTIVES

- To learn various insulating materials and properties, and.
- To study various breakdown mechanism in gas, solid, liquid.
- To study about Design and Manufacture of High Voltage Equipment.
- To learn the various testing of insulating materials.
- To learn Dynamic properties of dielectric materials.

UNIT I INSULATING MATERIALS IN HIGH VOLTAGE TECHNOLOGY 9

Requirement for insulating material-Properties and testing of insulating materials: Electrical properties, Thermal properties. Chemical Properties- Natural inorganic insulation materials-Synthetic inorganic insulation materials- Synthetic organic insulating materials.

UNIT II ELECTRIC FIELD ANALYSIS IN INSULATING MATERIALS 9

Electric field and breakdown voltage: Determination of electric fields, Maximum field strengths in

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

geometrically similar configurations, Formulation for the calculation of the breakdown voltage, Fields in multi dielectric, isotropic materials- Breakdown theory of gases-Breakdown theory in solid insulating materials: Thermal breakdown-Breakdown theory in Liquid insulation- Breakdown mechanism in vacuum insulation- Breakdown mechanism in Cryogenic insulation.

UNIT III DESIGN AND MANUFACTURE OF HIGH VOLTAGE EQUIPMENT 9

Structural details in high voltage technology: Basic arrangement of insulation system, Measures to avoid field intensification, Measures for air sealing oil insulated devices, Temperature rise calculation of insulation system- Design and development of high voltage capacitors- high voltage bushings-Design of transformer windings-Design of insulators for indoor and outdoor applications-Design of instrument transformers.

UNIT IV OVER VOLTAGES, TESTING PROCEDURES AND INSULATION CO ORDINATION 9

High voltage testing procedures and statistical treatment of results- Insulation coordination-Modern power system protective devices.

UNIT V NON- DESTRUCTIVE INSULATION TEST TECHNIQUES 9

Dynamic properties of dielectrics.-Dielectric loss and capacitance measurements-Partialdischarge measurements.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Learn about the various insulating materials and its properties.

CO2 Study various breakdown mechanisms in gas, solid and liquid insulation.

CO3 Analyze the design of High Voltage Equipment..

CO4 Learn the various testing of insulating materials and insulation coordination.

CO5 Learn Dynamic properties of dielectric materials.

TEXT BOOKS

1. N.H. Malik, A.A. Al-Arainy, M.I. Qureshi, Electrical insulation in powersystem, Marcell & DekkerInc, 1998.
2. Paul Gill, Electrical power equipment maintenance and testing, SecondEdition, CRC Press, 2016.

REFERENCES:

1. A. Bradwell (ed.), Electrical insulation, Peter Peregrinus Ltd., London,England, 1983.
2. E. Kuffel, W.S. Zaengl, J. Kuffel, High voltage Engineering fundamentals,Newnes (an imprint of Elsevier),2010.
3. Dieter Kind, Hermann Karner, High voltage insulation technology, Translated from the German by Y. Narayana Rao, Friedr. Vieweg&Sohn,Braunschweig, 1985.
4. M.S. Naidu and V.Kamaraju, 'High Voltage Engineering', McGraw Hill, 5thEdition, 2013.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2											1		
CO2	3	2			2								1		2
CO3	3	2			2								1	2	3
CO4	3	2	1										3	2	

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

CO5	2	2	1		1			3				2	2	2	

818EEE09 **WIRELESS POWER TRANSFER TECHNOLOGIES**

L	T	P	C
3	0	0	3

PREREQUISITE :Circuit Theory, Power Electronics

COURSE OBJECTIVES

- The fundamental principles of WPT for cable-free transfer power.
- Theories for inductive power transfer (IPT) based on the coupled inductor model and low-order circuit compensation.
- Specific converter topologies for lighting and battery charging applications.
- Technology trends in the adoption of WPT for key consumer applications.
- The future trends and impact of WPT

UNIT I INTRODUCTION 9

Review of transformers. Leakage inductance. Circuit compensation principles. Low- order compensations; series and parallel compensations. Resonance and operating frequency. Efficiency equation.

UNIT II POWER CONVERTER FUNDAMENTALS 9

DC-DC converters. AC-DC converters and inverters. PWM and soft switching principles. Basic topologies with transformers. Input, output and transfer characteristics of power converters. Incorporation of leaky transformer. Control methods.

UNIT III COMPENSATION CONFIGURATIONS 9

Types of compensation for inductor power transfer. Characteristics for various termination requirements. Design for load-independence output voltage and output current. Efficiency optimization.

UNIT IV APPLICATIONS 9

Circuit requirements for various loading conditions. Characteristics of LED loads, resistors and battery loads. Appropriate compensation design. Lighting systems. Battery charging profiles. Electric vehicle charging. Energy efficiency metric for charging.

UNIT V TECHNOLOGY TRENDS 9

Demand for safe power transfer and durable operation. Portable and smart devices. Mobile communication devices. IoT devices and systems. Sensors. Solid- state lighting development. Battery technologies. Electric vehicle development. Renewable source integration trends. Future trends and demand for wireless power transfer.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Understand the characteristics of power transfer through coupled inductors and the significance of leakage inductance.

CO2 Analyze and design appropriate compensation circuits and efficient power converters for WPT applications.

CO3 Understand technical requirements for applications involving solid-state loads and battery loads using WPT technologies.

CO4 Appreciate the factors affecting adoption of WPT in consumer applications including lightings, charging of smart phones and electric vehicles.

CO5 Predict the future demand of WPT.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

TEXT BOOKS

1. C. T. Rim and C. Mi, *Wireless Power Transfer for Electric Vehicles and MobileDevices*, New York: IEEE Press-Wiley, 2017.
2. J. I. Agbinya, *Wireless Power Transfer*, River Publishers, 2015.

REFERENCES:

1. Z. Huang, S. C. Wong, and C. K. Tse, "Design of a single-stage inductive- power-transfer converter for efficient EV battery charging," *IEEE Transactions on Vehicular Technology,* vol. 66, no. 7, pp. 5808-5821, July 2017.
2. L. Xu, Q. Chen, X. Ren, S. C. Wong, and C. K. Tse, "Self-oscillating resonant converter with contactless power transfer and integrated current sensing transformer," *IEEE Transactions on Power Electronics,* vol. 32, no. 6, pp. 4839-4851, June 2017.
3. W. Zhang, S. C. Wong, C. K. Tse, and Q. Chen, "Load-independent duality of current and voltage outputs of a series or parallel compensated inductive power transfer converter with optimized efficiency," *IEEE Journal of Emerging and Selected Topics in Power Electronics,* vol. 3, no. 1, pp. 137-146,March 2015.
4. J. Hou, Q. Chen. X. Ren, X. Ruan, S. C. Wong, and C. K. Tse, "Precise characteristicsanalysis of series/series-parallel compensated contactless resonant converter," *IEEE Journal of Emerging and Selected Topics in Power Electronics,* vol. 3, no. 1, 101-110, March 2015.
5. J. Hou, Q. Chen, S. C. Wong, C. K. Tse, and X. Ruan, "Analysis and control of series/series-parallel compensated resonant converters for contactless power transfer," *IEEE Journal of Emerging and Selected Topics in Power Electronics,*vol.3, no. 1, pp. 124-136, March 2015.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2											1		1
CO2	2	3	3	2			3					2		3	1
CO3	2	3	3										1		
CO4	2	3		2			2					2		2	1
CO5		2		2	2	2						3		2	1

GENDER, CULTURE AND DEVELOPMENT

L	T	P	C
1	0	0	0

PREREQUISITE : Nil

COURSE OBJECTIVES

- To familiarize with the concepts of sex and gender through literary and media
- To help students ask critical questions regarding gender roles in society.
- To provide students with the material to discuss gender issues such as gender based
- discrimination, violence and development.

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130

- To help students think critically about gender-based problems and solutions.

UNIT I INTRODUCTION TO GENDER 9

Definition of Gender - Basic Gender Concepts and Terminology -Exploring Attitudes towards Gender -Social Construction of Gender.

UNIT II GENDER ROLES AND RELATIONS 9

Types of Gender Roles- Gender Roles and Relationships Matrix -Gender-based Division and Valuation of Labour.

UNIT III GENDER DEVELOPMENT ISSUES 9

Identifying Gender Issues -Gender Sensitive Language- Gender, Governance and Sustainable Development - Gender and Human Rights- Gender and Mainstreaming.

UNIT IV GENDER-BASED VIOLENCE 9

The concept of violence- Types of Gender-based violence- The relationship between gender, development and violence-Gender-based violence from a human rights perspective.

UNIT V GENDER AND CULTURE 9

Gender and Film - Gender, Media and Advertisement.

TOTAL:45 PERIODS

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to:

CO1 Critically read literary and media texts and understand the underlying gender perspectives in them.

CO2 Analyze current social events in the light of gender perspectives.

CO3 Discuss, analyze and argue about issues related to gender.

CO4 Analyze and differentiate between gender-based violence.

CO5 Discuss the gender-based impact on society, culture and development.

TEXT BOOKS

1. Sukhu and Dukhu (Amar Chitra Katha). [Unit 1]
2. The Cat who Became a Queen (Folk tale, J. Hinton Knowles, Folk-Tales of Kashmir.London: Kegan Paul, Trench, Trübner, and Company, 1893, pp. 8-10.). [Unit 1]
3. Muniyakka (Short Story, Lakshmi Kannan, Nandanvan and Other Stories, Hyderabad:
4. Orient Blackswan, 2011). [Unit 2]
5. The Many Faces of Gender Inequality (Essay, Amartya Sen, Frontline, Volume 18 - Issue 22, Oct. 27 - Nov. 09, 2001) [Unit 3]

REFERENCE VIDEOS

1. Video Witness: Freeing Women from Cleaning Human Waste (2014, HRW, Manual Scavenging, India) [Unit 2]
2. Lights Out (Play, Manjula Padmanabhan) [Unit 4], Lights Out (Video of play enacted) [Unit 4]
3. Mahanagar (Movie: Satyajit Ray) [Unit 5]

G RANGANATH
Digitally signed by G RANGANATH
DN: C=IN, O=PERSONAL, T=5743, OID.2.5.4.65=477ffb4dbbd048fca3ebc0819eac5932, Phone=52395e01ffcfdff207f2ee203111911d02facc9c55479d3d2d69ce80f3fdcbd3, PostalCode=635109, S=Tamil Nadu, SERIALNUMBER=fd0cabc4c841372f49b7553888e0d3fd2a47f2cf77abb2bc845fe5200c1fb253, CN=G RANGANATH
Reason: I am the author of this document
Location:
Date: 2023-01-12 14:56:11

PRINCIPAL
Adhiyamaan College of Engineering (Autonomous),
Dr. M.G.R. Nagar, HOSUR - 635130