

NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Electrical Engineering

Semester-III

Course Code	2EE301
Course Title	Network Analysis and Synthesis

Course Learning Outcomes (CLO):

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

- understand the basic laws, theorems and the methods of analysing electrical circuits.
- analyse the properties of coupled circuits and usage of network graph to solve circuits.
- obtain the transient and steady-state response of electrical circuits.
- understand two port network and network synthesis.

L	T	P	C
3	1	0	4

Course Code	2EE302
Course Title	Signals and Systems

Course Learning Outcomes (CLO):

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

- interpret the signals in various forms for analysis
- analyse various signals in time domain and frequency domain systems
- obtain Fourier analysis of continuous time and discrete time signals

L	T	P	C
2	1	0	3

Course Code	2EE303
Course Title	Electromagnetic Field Theory

Course Learning Outcomes (CLO):

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

- apply vector calculus and coordinate system transformation in electromagnetic fields
- understand and calculate various parameters of electromagnetic fields
- apply Maxwell's equations to analyse electrical systems

L	T	P	C
3	1	0	4

Course Code	2EE304
Course Title	Analog and Digital Electronics

Course Learning Outcomes (CLO):

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

- conceptualize and analyse different electronic circuits
- select various components for electronic circuits
- design analog-digital electronic circuits for various applications

L	T	P	C
3	0	0	3

Course Code	2EE305
Course Title	Analog and Digital Electronics Laboratory

L	T	P	C
0	0	4	2

Course Learning Outcomes (CLO):

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

- compare BJT and FET technology
- suggest and choose application specific integrated circuit
- verify the operations of various analog and digital electronic circuits

Course Code	2MA303
Course Title	Applied Mathematics for Electrical Engineering

L	T	P	C
3	1	0	4

Course Learning Outcomes (CLO):

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

- comprehend and apply vector calculus and complex analysis in engineering problems
- make use of numerical methods
- apply the concept of Fourier series to solve electrical engineering problems
- use Laplace transformation technique to solve differential equations

Course Code	2HS341
Course Title	Principles of Management

L	T	P	C
2	0	0	2

Course Learning Outcomes (CLO):

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

- interpret the various theories and processes of management
- relate with different functional areas of management
- appreciate the role and need of managers in different organisations

Semester – IV

Course Code	2EE401
Course Title	Control Systems Engineering

Course Learning Outcomes (CLO):

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

- develop mathematical model of Linear Time Invariant (LTI) System
- understand behavior of LTI System in time and frequency domain
- understand design of controller
- understand state space representation of LTI system and concept of controllability & observability.

L	T	P	C
2	0	2	3

Course Code	2EE402
Course Title	Electrical Measurements and Transducers

Course Learning Outcomes (CLO):

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

- understand the concepts of measurement and measurement systems
- comprehend construction and working of various analog and digital instruments
- acquire knowledge on working, importance and applications of various transducers
- appreciate the relevance of data acquisition system and its application in electrical engineering

L	T	P	C
2	0	2	3

Course Code	2EE403
Course Title	Fundamentals of Power System

Course Learning Outcomes (CLO):

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

- understand the conventional and renewable energy sources of power generation, with associated issues and challenges
- apply the basic concepts of designing the transmission and distribution system
- know the technical specifications to be met by the utility and the consumer to ensure secure and economic functioning of the grid

L	T	P	C
3	1	0	4

Course Code	2EE404
Course Title	Transformers and DC Machines

Course Learning Outcomes (CLO):

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

L	T	P	C
3	0	2	4

- understand the construction and operating principle of transformers and DC machines
- acquire knowledge on performance indices of transformers and DC machines
- select transformers and DC machines for specific application based on characteristics
- understand the use of Permanent Magnet materials in DC machines

Course Code	2EE405
Course Title	Power Electronic Converters and Applications

Course Learning Outcomes (CLO):

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

L	T	P	C
3	0	0	3

- analyze operation of devices and choose the same suitable for an application
- evaluate various performance parameters of converters
- implement and analyze different control techniques for power electronic converters
- choose and apply converter topology suitable for an application

Course Code	2EE406
Course Title	Power Electronics Laboratory

Course Learning Outcomes (CLO):

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

L	T	P	C
0	0	4	2

- illustrate the characteristics and operation of various switching devices
- suggest triggering methods for various converters
- analyze and implement converter circuits by using suitable power semiconductor devices
- evaluate various performance parameters of converters
- apply suitable speed control method to various power electronic converter controlled dc motors

Course Code	2HS342
Course Title	Principles of Economics

Course Learning Outcomes (CLO):

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

L	T	P	C
2	0	0	2

- interpret the various basic economic principles
- relate the economic fundamentals with engineering practices
- infer the macro-economic aspects of engineering projects

Semester – V

EE501 Analysis of Electrical Power System [3 1 0 4]

Course Learning Outcome:

After successful completion of the course, student will be able to

- evaluate the performance parameters of transmission lines
- understand and analyze the effects of various faults in the power system
- select appropriate type of grounding system and reactive power compensation techniques

EE502 Rotating AC Machines [3 0 2 4]

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand construction and operating principle of induction motor and synchronous machine
- acquire knowledge on characteristics of induction motor and synchronous machine for different operating conditions
- test and calculate performance parameters of induction motor and synchronous machine
- analyze and select machine for specific application

EE503 High Voltage Engineering [3 0 2 4]

Course Learning Outcome:

After successful completion of the course, student will be able to

- plot electric field profile for simple configurations
- select the appropriate insulation (material, thickness, gap distance) for basic applications
- understand high voltage test setup for devices
- analyze the tests results and predict the imminent equipment failure

EE504 Power Electronic Converters [3 0 2 4]

Course Learning Outcome:

After successful completion of this course, students will be able to

- suggest converter topology based on application
- analyze and implement various control techniques for power electronic converters
- evaluate various performance parameters of converters

EE505 Utilization of Electrical Power [2 0 0 2]

Course Learning Outcome:

After successful completion of the course, student will be able to

- apply different techniques to use electrical energy to obtain heating, welding, illumination and electrolysis process
- design illumination scheme to obtain required lux level at given location
- analyze for electrical energy consumption in existing building and estimate for energy efficient design

EE506 Microprocessor and Microcontroller [3 0 2 4]

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the fundamentals and generalized architecture of microprocessor and microcontroller
- develop algorithm/program of the microprocessor and microcontroller for a particular task
- interface microcontrollers with external peripherals

EE507 Mini Project-I [0 0 2 1]

Course Learning Outcome:

After successful completion of the course, students will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- communicate and report effectively project related activities and findings

SP501 Fractional Course [1 0 0 0]

Course Learning Outcome:

After successful completion of the course, student will be able to

- know the recent technological developments in industries/ R & D organizations
- understand advanced topic related to electrical engineering discipline
- correlate the fundamentals with the contemporary application areas

Semester – VI

EE601 Power System Operation and Control [3 1 2 5]

Course Learning Outcome:

After successful completion of the course, student will be able to

- formulate the network matrices and determine the load flow solution using iterative methods
- distinguish various stability aspects and analyze their effects on the performance of power system
- suggest economic dispatch of load between generating stations
- analyze the effect of load variation on the frequency of the power system network

EE602 Electrical Drives and Traction Systems [3 0 2 4]

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand theoretical concepts of dynamics of electric drives
- analyze the performance of dc motor drives and induction motor drives for various operating conditions
- estimate energy consumption and decide rating of motor for traction application

EE603 Testing, Commissioning and Maintenance of Electrical Equipment [2 0 2 3]

Course Learning Outcome:

After successful completion of course, student will be able to,

- perform testing of various electrical equipment as per standard procedure and analyze results
- understand the process of commissioning
- appreciate and evaluate various maintenance methods / techniques
- suggest the remedial action to improve life of electrical equipment

EE604 Mini Project-II [0 0 2 1]

Course Learning Outcome:

After successful completion of the course, students will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- communicate and report effectively project related activities and findings

Department Elective - I

EE611 Electronic System Design [2 0 2 3]

Course Learning Outcome:

After successful completion of this course, students will be able to

- understand practical design aspects of component used in power electronic converters
- investigate the various output waveforms with necessary troubleshooting
- design and fabricate hardware for various applications

EE621 Permanent Magnet Brushless and Reluctance Motors

[2 0 2 3]

Course Learning Outcome:

After successful completion of course, student will be able to

- analyse properties and applications of Permanent Magnet (PM) materials
- understand constructional aspects, operational aspects and characteristic of brushless PM and reluctance motors
- analyse brushless PM and reluctance motors with application point of view

EE631 Renewable Energy Sources [2 0 2 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

- apply the concepts of renewable energy sources for electricity generation
- apply the concepts of grid integration with renewable sources
- evaluate the options and estimate the energy generation through renewable sources

EE641 Advanced Microprocessors and Microcontrollers [2 0 2 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the generalized architecture of advanced microprocessors and advanced microcontrollers
- develop algorithm/program of the advanced microcontrollers for a particular task
- interface advanced microcontrollers with external peripherals

Department Elective – II

EE612

Signals and Systems

[3 0 0 3]

Course Learning Outcome:

After successful completion of the course, students will be able to

- represent signals in various forms for analysis
- analyze various signals in time domain and frequency domain systems
- carry out Fourier analysis of continuous time and discrete time signals

EE622 Dynamics and Modelling of Electrical Machines [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand mathematical model of conventional electrical machines
- apply concept of reference frame theory for various ac machines
- analyze and predict the behavior of electrical machines for various operating conditions

EE632

Extra High Voltage Transmission

[3 0 0 3]

Course Learning Outcome:

After successful completion of course, student will be able to

- critically evaluate high voltage ac and dc system with all aspects
- design of transmission line with all aspects
- visualize behavior of transmission system under different conditions

SP601

Capstone Course

[1 0 0 0]

Course Learning Outcome:

After successful completion of the course, student will be able to

- solve the typical problems requiring higher order thinking skills
- link the different topics of curriculum studied and apply the concepts for solving typical questions of competitive exams
- perform better in final year placement process

Semester – VII

EE701 Electrical Machine Design [3 0 2 4]

Course Learning Outcome:

After successful completion of this course, students will be able to

- apply theoretical concepts in designing conventional electrical machines
- select appropriate material for designing electrical machines
- estimate the machine performance based on the design outcome by data interpretation
- demonstrate the design by appropriate drawings

EE702 Digital Signal Processors for Electrical Engineering [2 0 2 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand and appreciate the importance of architecture, memory and various instruction sets used in digital signal processors for various electrical applications
- initialize and perform basic coding in DSP for various electrical applications
- apply the knowledge of interfacing hardware and software for real time systems

EE703 Power System Protection and Switchgear [3 0 2 4]

Course Learning Outcome:

After successful completion of the course, student will be able to

- identify the main components and features of a protection scheme
- understand fault clearing phenomena under abnormal conditions in different type of circuit breakers
- acquire skill to design the feasible protection systems needed for each main part of a power system
- apply conventional and numerical relays to the protection of rotating machines, busbars, transformers, transmission lines and distribution network

EE704 Minor Project [0 0 4 2]

Course Learning Outcome:

After successful completion of the course, students will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- report project related activities effectively to peers and mentors

Department Elective – III

EE713 Application of Power Electronics in Power System [2 0 2 3]

Course Learning Outcome:

After successful completion of course, student will be able to

- understand various types of FACTS (Flexible AC Transmission Systems) controllers and their applications
- investigate and suggest solution for various power quality issues
- appreciate the role of power electronics in power systems
- apply the power electronic converter for given power quality issues

EE723 Design of Permanent Magnet Brushless and Reluctance Motors

[2 0 2 3]

Course Learning Outcome:

After successful completion of this course, students will be able to

- understand and apply design aspects of permanent magnet brushless and reluctance motors
- select appropriate material for design of permanent magnet brushless and reluctance motors
- design permanent magnet brushless and reluctance motors
- estimate and analyze performance of permanent magnet brushless and reluctance motors

EE733 Computer Techniques in Power System [2 0 2 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

- employ and develop computer techniques to determine various power system studies and analyze the same
- develop the mathematical model for economic load dispatch and prepare the unit commitment schedule
- understand and analyze contingency & security studies

Department Elective – IV

EE714 Electromagnetic Interference and Compatibility [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand EMI/EMC problems in electrical systems
- analyze the effects of EMI on system performance
- select appropriate technique to reduce the EMI effects on electrical systems

EE724 Control of Electric Drives [3 0 0 3]

Course Learning Outcome:

After successful completion of this course, students will be able to

- understand control aspects of electric drives
- select appropriate control strategy for given application
- integrate schematic blocks to control electric drives
- analyze performance of electric drives

EE734 Advanced Electrical Power System [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the concepts of preventive, emergency and restorative control of power system
- forecast the loading and estimate the operating state of power system
- analyze and determine the voltage stability of a power system

EE744 Electric Vehicles [3 0 0 3]

Course Learning Outcome:

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

- compare electric vehicles with fossil fuel driven vehicles and comprehend the basics of vehicle mechanics,
- analyse the fundamental electrochemistry of battery and sustainability of advanced energy storage systems,
- select suitable motor and understand the drive train of electric vehicles,
- gain broad knowledge of hybrid vehicles, networks, communications, actuators and controls used in modern automotive systems.

Semester – VIII

EE801

Major Project

[0 0 30 21]

Course Learning Outcome:

After successful completion of the course, students will be able to

- use various tools and techniques to study existing systems
- critically analyse existing systems, thereby select and justify parameters to be improved
- start and manipulate proposed engineering solution as per industry / research / societal need
- achieve precision in uses of the tools related to their experiments/fabrication
- reorganize and refine various components of technology to optimize the resources at large
- appraise the potential of technology for scalability and wide spectrum of applications
- report project related activities effectively to peers, mentors and society
- follow and value health, safety and ethical practices during project