NARAYANA ENGINEERING COLLEGE::GUDUR

AUTONOMOUS

# B.Tech

# E.C.E

## Course Structure

## &

## Syllabus

**(w.e.f 2021-22 academic year)**

## (NECR B.Tech 21)

NARAYANA

ENGINEERING COLLEGE

(AUTONOMOUS)

# NARAYANA ENGINEERING COLLEGE::GUDUR

AUTONOMOUS

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**Course Structure for B.Tech ECE w.e.f AY: 2021-22**

### SEMESTER I

| Course Code | Category | Course Title | Contact Periods per week | | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | Total | | Int. Marks | Ext. Marks | Total marks |
| 21MA1001 | BS | Algebra and Calculus | 3 | 1 | 0 | 4 | 4 | 40 | 60 | 100 |
| 21PH1001 | BS | Applied Physics | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21ES1002 | ES | Basic Electrical Engineering | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21ES1001 | ES | Problem Solving and Programming | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21PH1501 | BS | Applied Physics Lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21ES1502 | ES | Basic Electrical Engineering Lab | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| 21ES1505 | ES | Engineering and IT Workshop | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21ES1501 | ES | Problem Solving and Programming Lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21EN1502 | HS | Communication Skills Lab | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| 21MC8001 | MC | Mandatory course I | Induction Program | | | | | | | |
| | | Counselling/Mentoring | 0 | 0 | 1 | 1 | 0 | -- | -- | -- |
| | | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 | -- | -- | -- |
| | | Activity Point Programme | During the Semester | | | | | 20 Points | | |
| | | Total | **12** | **1** | **16** | **29** | **19.5** | **360** | **540** | **900** |

## SEMESTER II

| Course Code | Category | Course Title | Contact Periods per week | | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | Total | | Int. Marks | Ext. Marks | Total marks |
| 21CH1001 | **BS** | Chemistry | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21MA1004 | **BS** | Vector Calculus and Transforms | 3 | 1 | 0 | 4 | 4 | 40 | 60 | 100 |
| 21ES1005 | **ES** | Python Programming and Data Science | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EN1001 | **HS** | English | 2 | 0 | 0 | 2 | 2 | 40 | 60 | 100 |
| 21CH1501 | **BS** | Chemistry Lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21ES1503 | **ES** | Engineering Graphics | 0 | 1 | 4 | 5 | 3 | 40 | 60 | 100 |
| 21ES1508 | **ES** | Python Programming and Data Science Lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21EN1501 | **HS** | English Language Lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| | | Counselling/Mentoring | 0 | 0 | 1 | 1 | 0 | -- | -- | -- |
| | | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 | -- | -- | -- |
| | | Activity Point Programme | During the Semester | | | | | 20 Points | | |
| | | Total | **11** | **2** | **16** | **29** | **19.5** | **320** | **480** | **800** |

## SEMESTER III

| Course Code | Category | Course Title | Contact Periods per week | | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | Total | | Int. Marks | Ext. Marks | Total Marks |
| 21MA1005 | BS | Complex Analysis and Numerical Methods | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21ES1009 | ES | Data Structures and Algorithms | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21ES1010 | ES | Electronic Devices and Circuits | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2001 | PC | Digital Logic Design | 2 | 0 | 0 | 2 | 2 | 40 | 60 | 100 |
| 21EC2002 | PC | Network Analysis | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2003 | PC | Signals and Systems | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21ES1514 | ES | Electronic Devices and Circuits Lab | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| 21ES1513 | ES | Data Structures and Algorithms Lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21CD6001 | SC | Career Competency Development I | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| 21CC6001 | SC | Value Added Course/ Certificate Course I | 0 | 0 | 0 | 0 | 1 | 40 | 60 | 100 |
| 21MC8002-13 | MC | Mandatory Course II | 2 | 0 | 0 | 2 | 0 | 00 | 00 | 00 |
| | | Counselling/Mentoring | 0 | 0 | 1 | 1 | 0 | -- | -- | -- |
| | | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 | -- | -- | -- |
| | | Activity Point Programme | During the Semester | | | | | 20 Points | | |
| | | Total | **19** | **0** | **10** | **29** | **21.5** | **400** | **600** | **1000** |

## SEMESTER IV

| Course Code | Category | Course Title | Contact Periods per week | | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | Total | | Int. Marks | Ext. Marks | Total Marks |
| 21EN1002 | HS | Universal Human Values | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2004 | PC | Control Systems | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2005 | PC | Electromagnetic Theory and Transmission Lines | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2006 | PC | Electronic Circuit Analysis and Design | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2007 | PC | Probability theory and Stochastic processes | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| | OE | Open Elective I | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2501 | PC | Electronic Circuit Analysis and Design Lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21EC2502 | PC | MATLAB and Simulink Lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21EC2503 | PC | Networks and control systems lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21IC6001 | SC | Industry Oriented Course I | 0 | 0 | 0 | 0 | 1 | 100 | -- | 100 |
| 21CD6002 | SC | Career Competency Development II | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| | | Counselling/Mentoring | 0 | 0 | 1 | 1 | 0 | -- | -- | -- |
| | | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 | -- | -- | -- |
| | | Activity Point Programme | During the Semester | | | | | 20 Points | | |
| | | Total | **18** | **0** | **12** | **30** | **24.5** | **500** | **600** | **1100** |

## SEMESTER V

| Course Code | Category | Course Title | Contact Periods per week | | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | Total | | Int. Marks | Ext. Marks | Total Marks |
| 21EC2008 | PC | Analog and Digital Communications | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2009 | PC | IC Applications | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2010 | PC | Microprocessors and Microcontrollers | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC4001-06 | PE | Professional Elective I | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| | OE | Open elective II | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2504 | PC | Analog and Digital Communications Lab | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| 21EC2505 | PC | IC Applications Lab | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| 21EC2506 | PC | Microprocessors and Microcontrollers Lab | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| 21CD6003 | SC | Career Competency Development III | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| 21CC6002 | SC | Value Added Course/ Certificate Course II | 0 | 0 | 0 | 0 | 1 | 40 | 60 | 100 |
| 21EC7501 | PR | Internship I/on job training/Com Ser Project | 0 | 0 | 0 | 0 | 1.5 | 00 | 100 | 100 |
| 21MC8002-13 | MC | Mandatory Course III | 2 | 0 | 0 | 2 | 0 | 00 | 00 | 00 |
| | | Counselling/Mentoring | 0 | 0 | 1 | 1 | 0 | -- | -- | -- |
| | | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 | -- | -- | -- |
| | | Activity Point Programme | During the Semester | | | | | 20 Points | | |
| | | Total | **17** | **0** | **11** | **28** | **21.5** | **400** | **700** | **1100** |

## SEMESTER VI

| Course Code | Category | Course Title | Contact Periods per week | | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | Total | | Int. Marks | Ext. Marks | Total Marks |
| 21EC2011 | PC | Digital Signal Processing | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2012 | PC | VLSI Design | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC4007-12 | PE | Professional Elective II | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC4013-18 | PE | Professional Elective III | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| | OE | Open Elective III | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2507 | PC | Digital Signal Processing Lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21EC2508 | PC | Electronic Design Workshop | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21EC2509 | PC | VLSI Design Lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21IC6002 | SC | Industry Oriented Course II | 0 | 0 | 0 | 0 | 1 | 100 | -- | 100 |
| 21CD6004 | SC | Career Competency Development IV | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| | | Counselling/ Mentoring | 0 | 0 | 1 | 1 | 0 | -- | -- | -- |
| | | Sports/ Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 | -- | -- | -- |
| | | Activity Point Programme | During the Semester | | | | | | 20 Points | |
| | | Total | **15** | **0** | **12** | **27** | **21.5** | **460** | **540** | **1000** |

## SEMESTER VII

| Course Code | Category | Course Title | Contact Periods per week | | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | Total | | Int. Marks | Ext. Marks | Total Marks |
| 21HS5001-08 | HS | Humanities and Social Science Elective | 2 | 0 | 0 | 2 | 2 | 40 | 60 | 100 |
| 21EC2013 | PC | Embedded Systems | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2014 | PC | Microwave and Optical Communications | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC4019-24 | PE | Professional Elective IV | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC4025-30 | PE | Professional Elective V | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| | OE | Open Elective IV | 3 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 21EC2510 | PC | Embedded systems Lab | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| 21EC2511 | PC | Microwave and Optical Communications Lab | 0 | 0 | 3 | 3 | 1.5 | 40 | 60 | 100 |
| 21CD6005 | SC | Career Competency Development V | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| 21CC6501 | SC | Skill Development Training | 0 | 0 | 2 | 2 | 1 | 40 | 60 | 100 |
| 21EC7502 | PR | Internship II/on job training/Com Ser Project | 0 | 0 | 0 | 0 | 1.5 | 00 | 100 | 100 |
| 21MC8002-13 | MC | Mandatory Course IV | 2 | 0 | 0 | 2 | 0 | 00 | 00 | 00 |
| | | Counselling/Mentoring | 0 | 0 | 1 | 1 | 0 | -- | -- | -- |
| | | Sports/Hobby Clubs/Activities | 0 | 0 | 2 | 2 | 0 | -- | -- | -- |
| | | Activity Point Programme | During the Semester | | | | | | 20 Points | |
| | | Total | **19** | **0** | **12** | **31** | **23** | **400** | **700** | **1100** |

## SEMESTER VIII

| Course Code | Category | Course Title | Contact Periods per week | | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | Total | | Int. Marks | Ext. Marks | Total Marks |
| 21EC7503 | PR | Project work, seminar and internship | 0 | 0 | 0 | 0 | 12 | 60 | 140 | 200 |
| | | | **0** | **0** | **0** | **0** | **12** | **60** | **140** | **200** |

**Open Electives (OE) offered by ECE Department**

| S. No | Course Course Code | Subject |
|---|---|---|
| 1 | 21EC3001 | Digital Image Processing |
| 2 | 21EC3002 | Embedded Systems |
| 3 | 21EC3003 | Programming with MATLAB |
| 4 | 21EC3004 | VLSI Design |
| 5 | 21EC3005 | Sensors and Actuators |
| 6 | 21EC3006 | Internet of Things (IoT) |
| 7 | 21EC3007 | Microprocessors and Microcontrollers |
| 8 | 21EC3008 | Electronic Circuit Analysis and Design |
| 9 | 21EC3009 | Introduction to MEMS |
| 10 | 21EC3010 | Data Communication and Networks |
| 11 | 21EC3011 | Digital Logic Design |
| 12 | 21EC3012 | Analog and Digital Communications |

**PROFESSIONAL ELECTIVE (PE)**

**The Professional Elective Courses (PE)** are shown in different tracks/groups: The students will have options of selecting the electives from the different tracks/groups depending on the specialization one wishes to acquire.

| ELECTIVE TRACK/GROUP | Professional Elective-1 | Professional Elective-2 | Professional Elective-3 | Professional Elective-4 | Professional Elective-5 |
|---|---|---|---|---|---|
| **Communications** | An Introduction to coding theory (20EC4001) | Antennas (20EC407) | Satellite communication (20EC4013) | Wireless communication (20EC4019) | Signal Processing for mm Wave Communication for 5G and Beyond (20EC4025) |
| **Micro Electronics** | Industrial Electronics (20EC4002) | Micro Electronics (20EC4008) | Introduction to MEMS (20EC4014) | Fundamentals of Nano and Quantum Photonics (20EC4020) | High Speed Electronics (20EC4026) |
| **Signal & Image Processing** | MATLAB Programming For Numerical Computation (20EC4003) | Adaptive Signal Processing (20EC4009) | Introduction to Machine Learning (20EC4015) | Digital Image Processing (20EC4021) | Digital Speech Processing (20EC4027) |
| **VLSI** | Fundamentals of Micro and Nano Fabrication (20EC4004) | Mixed Signal Design (20EC4010) | RF Integrated Circuits (20EC4016) | Low Power VLSI Design (20EC4022) | FPGA Architectures (20EC4028) |
| **Embedded System** | Semiconductor Memories (20EC4005) | Real Time Operating Systems (20EC4011) | Introduction to Internet of things (20EC4017) | Advanced Embedded Logic design (20EC4023) | Embedded System Design with ARM (20EC4029) |
| **Automation** | Programmable Logic Controllers (20EC4006) | Electronic Measurements and Instrumentation (20EC4012) | Biomedical Instrumentation (20EC4018) | Virtual Instrumentation (20EC4024) | Process Control and Instrumentation (20EC4030) |
| **MOOCS** | MOOCS-1 (20EC4031) | MOOCS-2 (20EC4032) | MOOCS-3 (20EC4033) | MOOCS-4 (20EC4034) | MOOCS-5 (20EC4035) |

**HONORS**

| S. NO. | COURSE NAME | Course Course Code | CREDITS |
|---|---|---|---|
| 1 | Automotive Electronics | 21ECH001 | 4 |
| 2 | Low power VLSI Design. | 21ECH002 | 4 |
| 3 | Pattern Recognition | 21ECH003 | 4 |
| 4 | Micro Electromechanical Systems | 21ECH004 | 4 |
| 5 | VLSI Testing and Testability | 21ECH005 | 4 |

**MINORS**

| S. NO | SUBJECT | Course Course Code | CREDITS |
|---|---|---|---|
| 1 | Signals and Systems | 21ECM001 | 3 |
| 2 | Electronic Devices Circuits | 21ECM002 | 3 |
| 3 | Digital Logic Design | 21ECM003 | 3 |
| 4 | Analog & Digital Communications | 21ECM004 | 3 |
| 5 | Digital Signal Processing | 21ECM005 | 3 |

## Humanities and Social Science Elective

| S. NO | SUBJECT | Course Course Code | CREDITS |
|---|---|---|---|
| 1 | Managerial Economics & Financial Analysis | 21HS5001 | 3 |
| 2 | Management Science | 21HS5002 | 3 |
| 3 | E-Business | 21HS5003 | 3 |
| 4 | Organizational Behavior | 21HS5004 | 3 |
| 5 | Enterprise Resource Planning | 21HS5005 | 3 |

**HUMANITIES AND SOCIAL SCIENCES (HS)**

| SEMESTER | SUBJECT | Course Course Code | CREDITS |
|---|---|---|---|
| I | Communication Skills Lab | 21EN1502 | 1 |
| II | English | 21EN1001 | 2 |
| | English Language Lab | 21EN1501 | 1.5 |
| IV | Universal Human Values | 21EN1002 | 3 |
| VII | Humanities and Social Science Elective | 21HS5001-08 | 2 |
| | **TOTAL** | | **9.5** |

## BASIC SCIENCES (BS)

| SEMESTER | SUBJECT | Course Course Code | CREDITS |
|---|---|---|---|
| I | Applied Physics | 21PH1001 | 3 |
| | Algebra and Calculus | 21MA1001 | 4 |
| | Applied Physics Lab | 21PH1501 | 1.5 |
| II | Vector Calculus and Transforms | 21MA1004 | 4 |
| | Chemistry | 21CH1001 | 3 |
| | Chemistry Lab | 21CH1501 | 1.5 |
| III | Complex Analysis and Numerical Methods | 21MA1005 | 3 |
| | **TOTAL** | | **20** |

## ENGINEERING SCIENCES (ES)

| SEMESTER | SUBJECT | Course Course Code | CREDITS |
|---|---|---|---|
| I | Problem Solving and Programming | 21ES1001 | 3 |
| | Basic Electrical Engineering | 21ES1002 | 3 |
| | Engineering and IT Workshop | 21ES1505 | 1.5 |
| | Problem Solving and Programming Lab | 21ES1501 | 1.5 |
| | Basic Electrical Engineering Lab | 21ES1502 | 1 |
| II | Introduction to Python Programming | 21ES1005 | 3 |
| | Introduction to Python Programming Lab | 21ES1508 | 1.5 |
| | Engineering Graphics lab | 21ES1503 | 3 |
| III | Data Structures and Algorithms | 21ES1009 | 2 |
| | Electronic Devices and Circuits | 21ES1010 | 3 |
| | Data Structures and Algorithms Lab | 21ES1513 | 1 |
| | Electronic Devices and Circuits Lab | 21ES1514 | 1.5 |
| | **TOTAL** | | **25** |

## PROFESSIONAL CORE (PC)

| SEMESTER | Course Course Code | SUBJECT | | | CREDITS |
|---|---|---|---|---|---|
| III | 21EC2001 | Digital Logic Design | | | 3 |
| | 21EC2002 | Signals and Systems | | | 3 |
| | 21EC2003 | Network Analysis | (3) | 9 | 3 |
| IV | 21EC2004 | Electronic Circuit Analysis and Design | | | 3 |
| | 21EC2005 | Electromagnetic Theory and Transmission Lines | | | 3 |
| | 21EC2006 | Control System | | | 3 |
| | 21EC2007 | Probability Theory and Stochastic Process | | | 3 |
| | 21EC2501 | Networks and Control Systems Lab | | | 1.5 |
| | 21EC2502 | Electronic Circuit Analysis and Design Lab | | | 1.5 |
| | 21EC2503 | MATLAB and Simulink Lab | (4+3) | 16.5 | 1.5 |
| V | 21EC2008 | Analog and Digital Communications | | | 3 |
| | 21EC2009 | IC Applications | | | 3 |
| | 21EC2010 | Microprocessors and Microcontrollers | | | 3 |
| | 21EC2504 | Analog and Digital Communications Lab | | | 1 |
| | 21EC2505 | IC ApplicationsLab | | | 1 |
| | 21EC2506 | Microprocessors and Microcontrollers Lab | (3+2) | 12 | 1 |
| VI | 21EC2011 | Digital Signal Processing | | | 3 |
| | 21EC2012 | VLSI Design | | | 3 |
| | 21EC2507 | Digital Signal Processing Lab | | | 1.5 |
| | 21EC2508 | Electronic Design Workshop | | | 1.5 |
| | 21EC2509 | VLSI Design Lab | (3+3) | 10.5 | 1.5 |
| VII | 21EC2013 | Embedded systems | | | 3 |
| | 21EC2014 | Microwave and Optical Communications | | | 3 |
| | 21EC2510 | Embedded systems Lab | | | 1 |
| | 21EC2511 | Microwave and Optical Communications Lab | (1+2) | 8.5 | 1.5 |
| | | | | **TOTAL** | 56.5 |

## PROFESSIONAL ELECTIVES (PE)

| SEMESTER | SUBJECT | Course Course Code | CREDITS |
|---|---|---|---|
| **V Sem** | Professional Elective I | 21EC4001-06 | 3 |
| **VI Sem** | Professional Elective II | 21EC4007-12 | 3 |
| **VII Sem** | Professional Elective III | 21EC4013-18 | 3 |
| | Professional Elective IV | 21EC4019-24 | 3 |
| | Professional Elective V | 21EC4025-30 | 3 |
| | **TOTAL** | | **15** |

## OPEN ELECTIVES (OE)

| SEMESTER | SUBJECT | CREDITS |
|---|---|---|
| **IVSem** | Open Elective I | 3 |
| **V Sem** | Open Elective II | 3 |
| **VI Sem** | Open Elective III | 3 |
| **VIISem** | Open Elective IV | 3 |
| | **TOTAL** | **12** |

## SKILL ORIENTED COURSE (SC)

| SEMESTER | SUBJECT | | CREDITS |
|---|---|---|---|
| III Sem | Career Competency Development I | 21CD6001 | 1 |
| | Value Added Course/Certificate Course I | 21CC6001 | 1 |
| IV Sem | Industry Oriented Course I | 21IC6001 | 1 |
| | Career Competency Development II | 21CD6002 | 1 |
| V Sem | Career Competency Development III | 21CD6003 | 1 |
| | Value Added Course/Certificate Course II | 21CC6002 | 1 |
| VI Sem | Industry Oriented Course II | 21IC6002 | 1 |
| | Career Competency Development IV | 21CD6004 | 1 |
| VII Sem | Career Competency Development V | 21CD6005 | 1 |
| | Skill Development Training | 21CC6501 | 1 |
| | TOTAL | | **10** |

## PROJECT (PR)

| SEMESTER | SUBJECT | Course Course Code | CREDITS |
|---|---|---|---|
| V Sem | Internship I/on job training/Com Ser Project | 21EC7501 | 1.5 |
| VII Sem | Internship II/on job training/Com Ser Project | 21EC7502 | 1.5 |
| VIII Sem | Project work, seminar and internship | 21EC7503 | 12 |
| | **TOTAL** | | **15** |

| S. NO | CAT | CREDITS PER SEMESTER | | | | | | | | CREDITS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | |
| 1 | **HS** | 1 | 3.5 | | 3 | | | 2 | | **9.5** |
| 2 | **BS** | 8.5 | 8.5 | 3 | | | | | | **20** |
| 3 | **ES** | 10 | 7.5 | 7.5 | | | | | | **25** |
| 4 | **PC** | | | 9 | 16.5 | 12 | 10.5 | 8.5 | | **56.5** |
| 5 | **OE** | | | | 3 | 3 | 3 | 3 | | **12** |
| 6 | **PE** | | | | | 3 | 6 | 6 | | **15** |
| 7 | **PR** | | | | | 1.5 | | 1.5 | 12 | **15** |
| 8 | **SC** | | | 2 | 2 | 2 | 2 | 2 | | **10** |
| | **MC** | **No Credits** | | | | | | | | |
| | **TOTAL** | **19.5** | **19.5** | **21.5** | **24.5** | **21.5** | **21.5** | **23** | **12** | **163** |

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21ES1002 | BASIC ELECTRICAL ENGINEERING | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| I | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

**Pre-requisite: Fundamental of mathematics and physics**

**Course Objectives:**

1. To analyze AC and DC circuits with different types of circuits..
2. Analyze EMF and Torque Equations of DC Machines.
3. To understand the Applications of Transformers and AC Machines.

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | Analyze DC and AC circuits with different sources .(BL-4) |
| **CO 2** | Apply the concept of network theorems in solving DC and AC circuits .(BL-3) |
| **CO 3** | Discuss the operation and construction of DC machine.(BL-2) |
| **CO 4** | Describe the operation and construction of single and three phase transformer.(BL-2) |
| **CO 5** | Explain the operation and construction of AC Machines.(BL-2) |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| CO1 | 3 | 3 | 3 | | | | | | | | | | 2 | 3 |
| CO2 | 3 | 3 | 3 | 2 | | | | | | | | | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | | | | | | | | | 3 | 3 |
| CO4 | 2 | 2 | 3 | 2 | | | | | | | | | | |
| CO5 | 3 | 3 | 3 | 2 | | | | | | | | | | |

**COURSE CONTENT**

| MODULE – 1 | INTRODUCTION TO CIRCUITS | 10hrs |
|---|---|---|

Introduction to Voltage, Current, Power, Direct Current (DC), Alternating Current (AC), Electrical circuit elements (R, L and C) – Voltage and Current sources – KCL & KVL – Analysis of simple (Series and Parallel) circuits with DC Excitation.Average and RMS values – Phasor representation – Real Power, Reactive Power, Apparent Power, Analysis of Single phase AC circuits consisting of R, L, C, RL, RC, RLC circuits(series circuits only).

At the end of Module 1, students will be able to:

1. Analysis of Series and Parallel circuits with DC Excitation(BL-2)
2. Understand the Voltage, Current, Power, Direct Current (DC), Alternating Current.(BL-2)
3. Explain the Electrical circuit elements (R, L and C).(BL-2)
4. Explain the Single phase AC circuits.(BL-2)

| MODULE -2 | NETWORK THEOREMS | 10hrs |
|---|---|---|

Superposition theorem, Compensation theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Tellegen's theorem, Millman's theorem, Reciprocity theorem; Application of network theorems in solving DC and AC circuits.

At the end of the Module 2, students will be able to:

1. Understand the Application of network theorems in solving DC circuits. (BL-2)
2. Understand the Application of network theorems in solving AC circuits. (BL-2)
3. Explain various theorems. (BL-2)

| MODULE -3 | DC MACHINES | 08hrs |
|---|---|---|

Principle of operation of DC Generator - EMF Equation – Types of Generators – Magnetization and Load

| | | |
|---|---|---|
| Characteristics – Applications – Principle of operation of DC Motor – Torque Equation – Types of Motors – Brake Test on DC Shunt Motor - Characteristics – Applications. | | |
| At the end of the Module 3, students will be able to:<br>1. Explain the Types of Generators. (BL-2)<br>2. Understand the Characteristics and Applications of DC Machines. (BL-2)<br>3. Explain the Torque Equation and Types of Motors. (BL-3) | | |
| **MODULE -4** | **TRANSFORMERS** | **10hrs** |
| Principle of operation of Single phase Transformer – Types – EMF Equation – O.C and S.C. Tests of transformers, Voltage regulation and efficiency of transformers- Applications. | | |
| At the end of the Module 4, students will be able to:<br>1. Explain the types of Transformer. (BL-2)<br>2. Explain the Applications of Transformer. (BL-2)<br>3. Understand the single phase and three phase transformer at consumer premises. (BL-2) | | |
| **MODULE-5** | **AC MACHINES** | **10hrs** |
| Principle of operation of Alternator – Characteristics- applications –Principle of operation of single phase and three phase Induction Motors – Brake Test - Characteristics – Applications. | | |
| At the end of the Module 5, students will be able to:<br>1. Understand the concept of different type of AC machines. (BL-2)<br>2. Understand the Characteristics and Applications of AC Machines. (BL-3)<br>3. Explain the Principle of operation of three phase Induction Motor. (BL-2) | | |
| **Total hours:** | | **48hours** |


**Text Book(s):**

1. A Sudhakar and Shyam Mohan SP, “Circuits and Networks: Analysis and Synthesis”, TMH, 5th Edition, New Delhi, 2015.

2.Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press..

**Reference Book(s):**

1.S.Sivanagaraju, G.Kishor&C.Srinivasa Rao, "Electrical Circuit Analysis", Cengage Learning, 1st Edition, 2010.

2. A .Chakrabarti : Circuit Theory (Analysis and Synthesis), Dhanpat Rai &Co

3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013

4. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers, 2004

5. Ravish R., Network Analysis and Synthesis, 2/e, McGraw-Hill, 2015.

| NARAYANA ENGINEERING COLLEGE (AUTONOMOUS) :: GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21PH1001 | APPLIED PHYSICS | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| I | 3 | 0 | 0 | 60 | 3 | 40 | 60 | 100 |

**Pre-requisite:** Mathematics Knowledge, Basics concepts of Physics

**Course Objectives:**

1. To understand optical phenomenon i.e. interference and diffraction related to their engineering applications.
2. To explain the concepts and difference between classical free electron theory and quantum theory.
3. To impart knowledge in basic concepts of free electron theory of metals and semiconductors.
4. To illustrate the concepts of superconductor and nanomaterials in functioning of electronic devices.
5. To familiarize the types of laser/optical fibres and their applications in communication engineering devices

| **Course Outcomes**: After successful completion of the course, the student will be able to: | | BTL |
|---|---|---|
| **CO 1** | Explain the conecpts of interference, diffraction using Huygen's wave theory | 2 |
| **CO 2** | Comprehend the conecpts of matter waves, wave functions and their interpretation for understanding the matter at atomic scale | 1 |
| **CO 3** | Summarize the importance of free electron theories in determining the properties of metals and semiconductors | 1 |
| **CO 4** | Understand the concepts of superconductor and nanomaterials to familarize their applications in relevant fields | 2 |
| **CO 5** | Realize the importance of the lasers and optical fibres in engineering and medical applications | 2 |

| **CO-PO Mapping** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO** | **PO** | | | | | | | | | | | | **PSO** | |
| | **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** |
| **CO1** | **3** | **2** | | | | | | | | | | | | |
| **CO2** | **3** | **2** | | | | | | | | | | | | |
| **CO3** | **3** | **2** | | | | | | | | | | | **1** | |
| **CO4** | **3** | | | | | **1** | | | | | | | **1** | |
| **CO5** | **3** | **1** | | | | **1** | | | | | | | **1** | |
| 1: Low, 2-Medium, 3- High | | | | | | | | | | | | | | |

| **COURSE CONTENT** | | |
|---|---|---|
| **MODULE – 1** | **WAVE OPTICS** | **10 HOURS** |

**Interference**-Principle of Superposition, Interference of light, Conditions for sustained Interference, derivation of conditions for constructive and destructive interference of reflected light from a thin film, Newton's Rings-experimental arrangement, Determination of Wavelength; engineering applications of Interference

**Diffraction**-distinction between interference and diffraction, differences between Fresnel &Fraunhoffer diffractions, Fraunhoffer Diffraction at single slit(derivation, energy distribution curve) , Fraunhoffer Diffraction at a Double slit (derivation, energy distribution curve),Theory of Diffraction Grating, Engineering applications of diffraction

At the end of the Module 1, students will be able to:

1. **Explain** the need of coherent sources and the conditions for sustained interference (L2)
2. **Identify** engineering applications of interference including homodyne and heterodyne detection (L3)
3. **Analyze**the differences between interference and diffraction with applications (L4)

| MODULE -2 | INTRODUCTION TO QUANTUM MECHANICS | 9 HOURS |
|---|---|---|

Matter waves –de-Broglie hypothesis- properties, G.P.Thomson experiment, Phase and group velocities—Expression for group velocity; Heisenberg's uncertainty principle; Schrodinger's time dependent and independent wave equations – Physical significance of wave function-important characteristics of wave function, Eigen values and Eigen functions of a particle confined to one dimensional infinite square well (potential well).

At the end of the Module 2, students will be able to:

1. **Explain** Quantum Mechanics to understand wave particle dualism (L2)
2. **Necessity** of quantum mechanics to explore the behavior of sub atomic particles (L3)
3. **Evaluate** the Eigen values and Eigen functions of a particle (L2)

| MODULE-3 | FREE ELECTRON THEORY OF METALS & SEMICONDUCTORS | 10 HOURS |
|---|---|---|

Classical free electron theory-assumptions, expression for electrical conductivity, merits and demerits; Quantum free electron theory of metals-expression for electrical conductivity; Fermi-Dirac distribution, Mathiesson rule, causes of electrical resistance in metals, Bloch's theorem (Qualitative), Kronig - Penny Model (Qualitative), Classification of solids into conductors, semiconductors and insulators based on energy band gap.

Semiconductors- Introduction – Intrinsic and Extrinsic semiconductors– Density of charge carriers, Electrical conductivity, Fermi level of intrinsic semiconductors ; Hall effect – Hall coefficient – Applications of Hall effect.

At the end of the Module 3, students will be able to:

1. **Demonstrate** the success of quantum free electron theory over classical free electron theory (L2)
2. **Examine** the probability of occupancy of an electron in an energy state at different temperatures (L3)
3. **Outline** the properties of n-type and p-type semiconductors and charge carriers (L2)
4. **Identify** the type of semiconductor using Hall effect (L2)

| MODULE-4 | SUPERCONDUCTORS AND NANOMATERIALS | 10 HOURS |
|---|---|---|

Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – Josephson effects (AC and DC) – Applications of superconductors.

Nanomaterials– Significance of nanoscale , Properties of nanomaterials: Physical, mechanical, Magnetic, Optical ; Synthesis of nanomaterials: Top-down-Ball Milling, Bottom-up –Chemical vapour deposition ;Applications of Nano materials.

At the end of the Module 4, students will be able to:

1. **Explain** how electrical resistivity of solids changes with temperature (L2)
2. **Classify** superconductors based on Meissner's effect (L2)
3. **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2)
4. **Identify** the nano size dependent properties of nanomaterials (L2)
5. **Illustrate** the methods for the synthesis (L2)
6. **Apply** the basic properties of nanomaterials in various Engineering branches (L3).

| MODULE-5 | LASERS & OPTICAL FIBERS | 9 HOURS |
|---|---|---|

Lasers: Introduction, properties of lasers: monochromaticity, coherence, directionality, brightness; Spontaneous & stimulated emission of radiation, Einstein coefficients, Population inversion, Pumping methods, Types of lasers: Nd- YAG Laser, He–Ne Laser, Semiconductor laser; Applications.

Introduction to Optical Fibers-Total Internal Reflection-Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of optical fibers based on materials, modes and refractive index profile-Applications: fiber

| |
|---|
| optic communication system and sensors. |
| At the end of the Module 5, students will be able to:<br>1. **Understand** the basic concepts of LASER light Sources (L2)<br>2. **Apply** the concepts to learn the types of lasers (L3)<br>3. **Identify** the Engineering applications of lasers (L2)<br>4. **Explain** the working principle of optical fibers (L2)<br>5. **Classify** optical fibers based on refractive index profile and mode of propagation (L2) |
| **Total hours: 48 hours** |

**Text Book(s):**


1. M. N. Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy" AText book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
2. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2012.
3. S.O.Pillai, "Solid State Physics", 8th edition, New Age International Publishers, 2018.


**Reference Book(s):**


1. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education,2018
2. N. Subrahmanyam, BrijLal, A Textbook of Optics, S. Chand, New Delhi, 2015
3. Kittel, C. Introduction to Solid State Physics‖. Wiley, 2005.
4. K. Thyagarajan, Engineering Physics, McGraw-Hill Education (India) Pvt. Ltd, 2016.
5. AjoyGhatak, Optics, 5th Edition, McGraw Hill, 2012
6. O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.
7. William T. Silfvast, "Laser Fundamentals" 2nd edition, Cambridge University Press, 2004.
8. T. Pradeep, "A Text Book of Nanoscience and Nanotechnology", Tata Mc Graw Hill, 2003

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21PH1501 | **Applied Physics lab** | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| ii | 0 | 0 | 2 | 36 | 1 | 40 | 60 | 100 |

**Pre-requisite: Nil**

**Course Objectives:**

1. To provide student to learn about some important experimental techniques in physics with knowledge in theoretical aspects so that they can excel in that particular field. To prepare students for performing requirement analysis and design of variety of applications.
2. To enable the students to understand theconcepts of interference and diffraction and their applications.
3. To educate students to recognize the applications of laser in finding the wavelength, slit width and its role in diffraction studies
4. To make the students to understand the important parameters of optical fibres and metals

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | learn important concepts of physics through involvement in the experiments by applying theoretical knowledge. |
| **CO 2** | understand theconcepts of interference and diffraction and their applications. |
| **CO 3** | recognize the applications of laser in finding the wavelength, slit width and its role in diffraction studies |
| **CO 4** | understand the important parameters of optical fibres and metals |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **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** |
| **CO1** | 2 | 1 | | | | | | | | | | | | |
| **CO2** | 2 | 1 | | | | | | | | | | | | |
| **CO3** | 2 | 1 | | | | 1 | | | | | | | | |
| **CO4** | 2 | 1 | | | | 1 | | | | | | | | |

1: Low, 2-Medium, 3- High

| **COURSE CONTENT** | **CO** |
|---|---|
| **Task -1** Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect. | |
| The objective :To determine<br>a) sign of the charge carriers,<br>b) charge carrier concentration,<br>c) mobility of the charge carriers of a given semiconductor | CO 1 |
| **Task - 2 To determine the resistivity of semiconductor by Four probe method** | |

| | |
|---|---|
| Objective:To determine the resistivity of semiconductor by Four probe method | CO 1 |
| **Task -3** Determine the energy gap of a given semiconductor diode. | |
| Objective:To plot characteristics between reverse saturation current and 103 /T and find out the approximate value of Energy Band Gap in PN junction diode | CO 1 |
| **TASK -4** Measurement of radius of curvature of a lens by Newton's rings method. | |
| Objective:To determine the wavelength of sodium light by Newton's Ring method<br>The key idea behind Newtons ring experiment is the thin film formation between a plane-convex lens and a glass plate. Due to this thin film of air a path difference occurs in the waves which reflect from the lower surface of the lens and the top surface of the glass plate. As a result of it, they superimpose and develop the interference pattern. | CO 2 |
| **TASK -5. Determine the thickness of the wire using wedge shape method** | |
| Objective:To calculate the thickness of a thin wire by forming interference fringes using an air wedge arrangement.<br>The key idea behind this experiment is the formation of thin wedge shaped film between two plane glass plates. Due to this thin film of air, a path difference occurs between waves reflected from top and bottom surface of the film. On superimposition of these waves an interference pattern containing a number of straight line fringes will be produced | CO 2 |
| **TASK-6 Determination of wavelength by plane diffraction grating normal incidence method** | |
| Objectives: 1.To understand the types of diffraction<br>2.To familiarize with the principle of diffraction in plane transmission grating<br>3. To know the procedure for standardization of the grating<br>4.To determine the wavelengths of prominent spectral lines of mercury spectrum.<br>An arrangement, which is equivalents in its action to a large number of parallel slits of same width separated by equal opaque spaces is called diffraction grating. It is constructed by ruling fine equidistant parallel lines on an optically plane glass plate with the help of a sharp diamond point. | CO 2 |
| **TASK -7 Dispersive power of a diffraction grating** | |
| objective: To determine Dispersive power of a diffraction grating<br>When white light passes through a grating, different wavelengths undergo different angles of diffraction. Hence white light split up into different colours and diffraction spectra of different orders will be produced. The angular dispersion or dispersive power of a grating is defined as the rate of change of angle of diffraction with the change of wavelength in a particular order of the spectrum. | CO 2 |
| **TASK -8 Determination of wavelength of LASER light using diffraction grating** | |
| Objectives :1. To determine the concept of diffraction<br>2. To determine the wavelength of the given Laser source. | CO 3 |
| **TASK -9 .Laser: Diffraction at a single slit** | |
| Objective:Determination of width of a given single slit using laser diffraction method<br>Laser beam has high monochromaticity,coherence and directionality. Hence it forms a clear diffraction pattern and we can measure width of a single slit accurately. | CO 3 |

| | |
|---|---|
| **TASK -10 To determine the numerical aperture and acceptance angle of a given optical fibre** | |
| Objective: To determine the numerical aperture and acceptance angle of a given optical fiber.<br>In optical fibres light travel by multiple total internal reflections. Numerical aperture represents light gathering powerof optical fibre. Acceptance angle represents maximum limiting angle at one end of optical fibre for the liglht ray to travel by multiple total internal reflections through the core region of thefibre.<br>1. Optical fibers may be used for accurate sensing of physical parameters and fields like pressure, temperature and liquid level.<br>2. For military applications like fiber optic hydrophones for submarine and underwater sea application and gyroscopes for applications in ships, missiles and aircrafts. | CO4 |
| **Additional Experiments:** | |
| **TASK -11 Laser: Diffraction at a double slit** | |
| Objective:Determination of width of a given double slit using laser diffraction method.<br>With this experiment we can demonstrate diffraction nature of lasers and measure width of a double slit accurately. | CO 3 |
| **TASK -12:**Determination of Fermi energy of a metal. | |
| Objective: To determine Fermi energy of a metal.<br>Fermi energy represents highest energy level occupied by the electron at 0 K in a metal. | CO4 |


**Text Book(s):**

1. C. L. Arora, “Practical Physics”, S. Chand & Co., New Delhi, 3rd Edition, 2012.
2. Vijay Kumar, Dr. T. Radhakrishna, “Practical Physics for Engineering Students”, S M Enterprises, 2nd Edition, 2014.

**Reference Book(s):**

1. S. Balasubramanian, M.N. Srinivasan “A Text book of Practical Physics”- S Chand Publishers, 2017.
2. C.H. Bernard and C.D. Epp, John Wiley and Sons, "Laboratory Experiments in College Physics" Inc., New York, 1995.
3. Dr.Ruby Das, C.S.Robinson, Rajesh Kumar and Prasanth Kumar “A text book of Engineering Physics Practical”, 1st edition, Sahu University Science Press, 2010.
4. Jayaraman, “Engineering Physics Laboratory Manual”, 1st edition, Pearson Education, 2014.

| NARAYANAENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21MA1001 | ALGEBRAANDCALCULUS | | | | | | | R-21 |
| Semester | Hours /Week | | | Total hrs | Credit | MaxMarks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| I | 3 | 1 | 0 | 64 | 4 | 40 | 60 | 100 |
| **Pre-requisite**: IntermediateMathematics | | | | | | | | |

**Course Objectives:**

1. To familiarize the students with the theory of matrices and quadratic forms.
2. To analyze second order ordinary differential equations.
3. To explain the series expansions using mean value theorems and the concepts of multivariable calculus.
4. To summarize the procedure to solve the partial differential equations.
5. To explain the student with mathematical tools needed in evaluating multiple integrals and its applications.

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO1** | **Make use** the concepts of Matrices**to solve various Engineering problems.(BL-3)** |
| **CO2** | **Identify**different types of higher order differential equations and their applications**in solving engineering problems.(BL-3)** |
| **CO3** | **Apply**Mean value theorems, Multi variable calculus**to solve engineering problems. (BL-3)** |
| **CO4** | **Apply**a range of techniques**for solutions of first order Linear and non-Linear Partial Differential Equations (PDE).(BL-3)** |
| **CO5** | **Apply**the techniques ofmultiple integrals **for the area and volume of the region bounded by curves. (BL-3)** |

| CO-POMapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO | | | | | | | | | | | | PSO | |
| | PO1 | 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 |
| CO1 | 3 | 3 | | | | | | | | | | | | |
| CO2 | 3 | 3 | | | | | | | | | | | | |
| CO3 | 3 | 3 | | | | | | | | | | | | |
| CO4 | 3 | 3 | | | | | | | | | | | | |
| CO5 | 3 | 3 | | | | | | | | | | | | |
| 1-Low,2-Medium,3-High | | | | | | | | | | | | | | |

| COURSECONTENT | | |
|---|---|---|
| **MODULE–1** | **Matrices** | **Hours:16h(12L+4T)** |
| Rankof amatrixby echelonform,normalform.Solvingsystem of homogeneousandnon-homogeneouslinearequations.EigenvaluesandEigenvectorsandtheirproperties(without proof),Cayley-Hamiltontheorem(withoutproof),findinginverseandpowersofamatrixbyCayley-Hamiltontheorem,Diagonalization. | | |
| Atthe endof theModule1,studentwillbeableto:<br>1. Solvingsystemoflinearequations. (BL-3)<br>2. Determinetherank,eigenvalues andeigenvectors. (BL-3)<br>3. Findtheinverseandpowersofasquarematrixby Cayley-HamiltonTheorem. (BL-1) | | |
| **MODULE-2** | **HigherOrderOrdinaryDifferentialEquationswith ConstantCoefficients** | **Hours:14h(11L+3T)** |

Definitions,homogenousandnon-homogenous,Complimentaryfunction,generalsolution,particularintegral,methodofvariationofparameters.applicationstoL-C-RCircuits

Atthe endof theModule2,studentswillbeableto:

1. Identifytheessentialcharacteristicsoflinear differentialequationswithconstant coefficients. (BL-3)
2. Solvethelineardifferentialequationswithconstant coefficientsbyappropriatemethod. (BL-3)
3. Classifyandinterpretthesolutionsoflineardifferentialequations. (BL-2)
4. Solvethehigherorderdifferentialequationbyanalyzingphysicalsituations. (BL-3)

| MODULE-3 | MeanValueTheoremsandMultivariableCalculus | Hours:12h(9L+3T) |
|---|---|---|

Taylor's and Maclaurin's theorems with remainders (without proof), related problems, Partialdifferentiation, Chain rule, Total derivative, Jacobians, maxima and minima of functions of twovariables,methodofLagrange'smultipliers.

Atthe endoftheModule3,studentswillbeableto:

1. Translatethegivenfunctionasseries ofTaylor'sandMaclaurin'swithremainders. (BL-2)
2. Find the maximum and minimum values of the function for two variables. (BL-1)
3. Apply Jacobian concept to deal with problems in change of variables. (BL-3)

| MODULE-4 | PartialDifferentialEquations | Hours:10h (7L+3T) |
|---|---|---|

Introduction and formation of Partial Differential Equations by elimination of arbitrary constantsandarbitraryfunctions,Solutionsoffirstorderlinearpartialdifferentialequationsusing Lagrange's method, Solutions of first order non-linear partial differential equations- Standardforms-I,II,IIIandIV,Methodofseparationofvariables.

Atthe endof theModule4,studentswillbeableto:

1. Identify the basic properties of partial differential equations. (BL-3)
2. Outline partial differential equations.(BL-2)
3. Solve the applications of PDE by using the method of separation of variables. (BL-3)
4. Apply the PDE techniques in various engineering fields. (BL-3)

| MODULE-5 | MultipleIntegrals | Hours:12h(9L+3T) |
|---|---|---|

Doubleintegrals,changeof order of integration,changeof variables.Evaluationof Tripleintegrals, change of variables between Cartesian, Cylindrical and Spherical polar coordinates.Findingareasandvolumes usingdouble andtripleintegrals.

Atthe endoftheModule5,studentswillbeableto:

1. Find the area bounded by a region using double integration.(BL-1)
2. Solve triple integrals.(BL-3)
3. Make Use of multiple integral techniques in engineering problems. (BL-3)

| Totalhours | 64h (48L+16T) |
|---|---|

**TextBooks:**


1. ErwinKreyszig,AdvancedEngineeringMathematics,10/e,JohnWiley&Sons,2011.
2. B.S.Grewal, HigherEngineeringMathematics,44/e,Khannapublishers,2017.

**ReferenceBook(s):**


1. R.K.JainandS.R.K.Iyengar,AdvancedEngineeringMathematics,5/e,2019 Narosa Publishing house
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education,2017
3. H.K.Das,Er.RajnishVerma,HigherEngineeringMathematics,S.Chand,2014
4. N.Bali,M.Goyal,C.Watkins,AdvancedEngineeringMathematics,InfinitySciencePress,9th edition 2020.

| NARAYANAENGINEERINGCOLLEGE::GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21ES1501 | ProblemSolvingandProgrammingLab | | | | | | | R21 |
| Semester | Hours/Week | | | Total hrs | Credit | MaxMarks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| I | 0 | 0 | 3 | 48 | 1.5 | 40 | 60 | 100 |

**Pre-requisite:**MathematicsKnowledge,Analytical&LogicalSkills

**CourseObjectives:**

1. Toworkwiththe compounddatatypes
2. Toexploredynamicmemoryallocation concepts
3. Todesign theflowchart and algorithmforrealworld problems
4. TowriteCprograms for realworld problemsusing simpleand compounddatatypes
5. Toemployeegoodprogrammingstyle,standardsandpracticesduringprogramdevelopment

**CourseOutcomes**:Aftersuccessfulcompletionofthecourse,Studentwillbeableto:

| | |
|---|---|
| **CO1** | Translatealgorithmsintoprograms(InClanguage)(BL-2) |
| **CO2** | CodeanddebugprogramsinC programlanguage using variousconstructs.( BL-3) |
| **CO3** | Solvetheproblemsand implement algorithmsinC.(BL-3) |
| **CO4** | Makeuseof differentdatatypes to handletherealtime data(BL -3) |

**CO-POMapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO 2 |
| CO1 | 1 | 2 | | | | | | | | | | | 1 | |
| CO2 | 2 | 2 | 2 | | | | | | | | | | 2 | 1 |
| CO3 | 2 | 2 | 3 | 1 | 2 | | | | | | | | 2 | 2 |
| CO4 | 2 | 2 | 3 | 1 | 1 | | | | | | | | 2 | 2 |

1:Low, 2-Medium, 3-High

| COURSECONTENT | CO |
|---|---|
| **TASK-1(3H)** | |
| 1. PracticeDOSandLINUXCommandsnecessaryforexecutionofCPrograms.<br>2. StudyoftheEditors,Integrateddevelopmentenvironments,andCompilersinchosenplatform.<br>3. Write,Edit,Debug,CompileandExecuteSample Cprogramstounderstandthe Programmingenvironment. | CO1 |
| **TASK-2(3H)** | |
| 1.Practiceprograms:Findingthesumofthreenumbers,exchangeoftwonumbers,largestoftwonumbers,tofindthesizeofdatatypes,Programsonprecedenceand Associativityofoperators,sampleprogramsonvariouslibraryfunctions. | CO1 |
| **TASK-3 (6H)** | |

| | |
|---|---|
| 1. Write a program to find the roots of a Quadratic equation.<br>2. Write a C program to calculate the factorial of a given positive integer.<br>3. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 & 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence. | CO1 |
| **TASK-4 (6H)** | |
| 1. Write a C program to find the sum of individual digits of a positive integer.<br>2. Write a program to reverse the digits of a number.<br>3. Write a program to generate the series of prime numbers in the given range.<br>4. Write a program to check for number palindrome. | CO 2 |
| **TASK-5 (6H)** | |
| 1. Write a C program for the following that use both recursive & non-recursive functions:<br>a. To calculate the factorial of a given positive integer.<br>b. To find the greatest common divisor of two given integers.<br>c. To generate Fibonacci series.<br>2. Illustrate the use of auto, static, register and external variables. | CO 2 |
| **TASK-6 (3H)** | |
| 1. Write a program to find the sum of positive and negative numbers in a given set of numbers.<br>2. Write C code to reverse the elements of the array. For example, [1,2,3,4,5] should become [5,4,3,2,1]<br>3. Write a program to find the maximum of a set of numbers. | CO 3 |
| **TASK-7 (6H)** | |
| 1. Write a C program that use pointers to find Addition of Two Matrices<br>2. Write a C program that use functions to find Multiplication of Two Matrices | CO 3 |
| **TASK-8 (3H)** | |
| 1. Write a program to accept a line of characters and print the number of vowels, Consonants, blank spaces, digits and special characters.<br>2. Write a C program to check whether a given string is a palindrome or not, without using any built-in functions. | CO 3 |
| **TASK-9 (6H)** | |
| 1. Write a C program to find the length of a given string using pointers.<br>2. Write a C program to add two distances in feet and inches using structure<br>3. Write a C program to read and print an employee's detail using structure<br>4. Write a C program to read and print book information using union | CO 4 |
| **TASK-10 (6H)** | |

| | |
|---|---|
| 1. Write a program to split a "file" into two files, say file1 and file2. Write lines into the 'file' from standard input. Read the contents from 'file' and write odd numbered lines into file1 and even numbered lines into file2.<br>2. Write a program to merge two files. | CO 4 |
| **ADDITIONAL TASKS** | |
| 1. Write a program to find the Abundant Number<br>2. Write a program to insert the element in a given position | |

**TextBook(s):**


1. "HowtoSolve itby Computer",R.G.Dromey, 2014,Pearson.
2. ProgramminginCandDataStructures,J.R.Hanly,AshokN.KamthaneandA.AnandaRao,Pearson Education, 1st Edition, 2010.


**ReferenceBook(s):**


1. "TheCProgrammingLanguage",BrianW.Kernighan,DennisM.Ritchie,2nd Edition,Pearson.
2. "LetusC",YeswantKanetkar,BPBpublications
3. "PointersinC",Yeswant Kanetkar,BPBpublications,16th Edition,2017
4. ComputerScience,AStructuredProgrammingApproachUsingCbyBehrouzForouzan&RichardF. Gilberg,3rd Edition, CengageLearning
5. CProgrammingAProblem-SolvingApproach,BehrouzA.Forouzan&E.V.Prasad,
6. F.Gilberg, 3rd Edition, Cengage Learning
7. ProgrammingwithCRemaTheraja,Oxford,2018
8. ProgramminginC,3rd Edition,2015,Ashok N.Kamthane,Pearson Education
9. ProgramminginC,3/e:APracticalApproachbyAjayMittal,PearsonPublication
10. ProblemSolvingwithCbySOMASHEKARA,M.T.,GURU,D.S.,MANJUNATHA,K. S., PHI Learning, 2nd Edition, 2018
11. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press, 2001
12. Byron Gottfried, Schaum's Outline of Programming with C, 4th Edition, 2018, McGraw- Hill

| NARAYANAENGINEERINGCOLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21ES1001 | PROBLEMSOLVING&PROGRAMMING | | | | | | | R21 |
| Semester | Hours /Week | | | Totalhrs | Credit | MaxMarks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| I | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |
| **Pre-requisite:**MathematicsKnowledge,Analyticaland Logicalskills | | | | | | | | |

**CourseObjectives:**

- TounderstandvariousstepsinProgramdevelopment.
- Tounderstandthebasicconcepts inCProgrammingLanguage.
- TolearnhowtowritemodularandreadableCPrograms.
- Tolearnthesyntaxandsemanticsof aCProgramming language.
- Tolearnstructuredprogrammingapproachforproblemsolving.

**CourseOutcomes**:Aftersuccessfulcompletionofthecourse,thestudentwillbeableto:

| | |
|---|---|
| **CO1** | Identifymethods tosolveaproblemthroughcomputerprogramming.**(BL-3)** |
| **CO2** | Understandtheuseofoperatorsandinput/output.**(BL-2)** |
| **CO3** | Understand the difference and the usage of various control statements and Functions**(BL -2)** |
| **CO4** | ApplytheArraysandPointersforsolvingproblems.**(BL-3)** |
| **CO5** | ExplainUser-DefinedData TypesandFiles.**(BL-2)** |

**CO-POMapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| **CO1** | 3 | 3 | | | | | | | | | | | 1 | |
| **CO2** | 1 | 2 | 1 | | | | | | | | | | 1 | |
| **CO3** | 1 | 2 | 1 | | 2 | | | | | | | | 2 | 2 |
| **CO4** | 2 | 2 | 3 | 2 | 1 | | | | | | | 2 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 2 | | | | | | | | 1 | 2 | |

1:Low,2-Medium,3-High

| COURSECONTENT | | |
|---|---|---|
| **MODULE–1** | **FundamentalsofComputersandProgramming** | **10HOURS** |

**IntroductiontoProgramming,AlgorithmsandFlowcharts:**ProgramsandProgramming,Programminglanguages,Compiler, Interpreter,Algorithms,Flowcharts,HowtoDevelopaProgram.

**BasicsofC:**Introduction**,**CharacterSet,StructureofaCProgram,ASimpleCProgram,Variables, DataTypesandSizes,Declaration, Identifiers,Keywords, Constants,Assignment,andInitialization.

Atthe endof theModule1,studentswillbeableto:

1. Solveproblemsusinglanguageindependentnotations.**(BL-3)**
2. Understandthecompilersandinterpreters.**(BL- 2)**
3. UnderstandBasic StructuredofProgramminginC.**(BL- 2)**
4. Developalgorithmsandflowcharts forproblems.**(BL -3)**
5. UnderstandvariousTokensinClanguage.**(BL-2)**

| MODULE-2 | OperatorsandInputand Output | 9 HOURS |
|---|---|---|

**Operators and Expressions:** Arithmetic Operators, Relational Operators,Logical Operators, BitwiseOperators,ConditionalOperator,Commaoperator,sizeofoperator,Expressions,LvaluesandRvalues,ExpressionEvaluation-PrecedenceandAssociativity,TypeConversion.

**Input and Output:** Basic Screen and Keyboard I/O in C, Formatted Input and Output, UnformattedInputandOutputFunctions**.**

Attheendof theModule2,studentswillbeableto:

1. Illustratetheworkingofexpressions.**(BL-2)**
2. UnderstandtheprecedenceandAssociativityrulesofoperators.**(BL-2)**
3. Understandtherulesoftypeconversion.**(BL-2)**
4. ExplaintheFormattedandUnformattedI/Ofunctions.**(BL-2)**

| MODULE-3 | ControlStatementsand Functions | 10HOURS |
|---|---|---|

**Control Statements:** Selection Statements - if, Nested if, if-else, Nested if-else, else-if ladder, switchLooping Statements-while,do-while,for,Nestedloops,UnconditionalStatements-goto,break,Continue,return.

**Functions:** Introduction, Using Functions, Passing Arguments to a Function, Working with Function,ScopeandExtent,Recursion,TheCPreprocessor,Storageclasses

Atthe endof theModule3,studentswillbe ableto:

1. UnderstandSelectionStatements.**(BL-2)**
2. UnderstandLoopingandUnconditionalStatements.**(BL-2)**
3. Understandthebasicconceptoffunctions.**(BL- 2)**
4. UnderstandconceptsofRecursion,Preprocessorandstorageclasses.**(BL-2)**

| MODULE-4 | ArraysandPointers | 10HOURS |
|---|---|---|

**Arrays and Strings:** Introduction, One-Dimensional Array, Multidimensional Arrays, Passing Arraysto Function, Strings - Declaration, Initialization, Printing Strings, String Input, Character Manipulation,StringManipulation,Arraysof Strings.

**Pointers:**Fundamentals,PointerDeclarations,Operationsonpointers,PassingPointerstoaFunction, PointersandArrays,Arraysof Pointers,PointertoPointer,Pointerto Functions,Commandlinearguments,Dynamic Memory Management.

Atthe endof theModule4,studentswillbeableto:

1. UnderstandtheconceptofArrays.**(BL- 2)**
2. Understandtheconceptofpointers.**(BL- 2)**
3. ExplainDynamicMemoryManagement.**(BL-2)**

| MODULE-5 | User-DefinedDataTypesand Files | 9HOURS |
|---|---|---|

**Structures and Unions:** Basics of Structures, Nesting of Structures, Arrays of Structures, Structuresand Pointers, Structures and Functions, Self-Referential Structures, Unions, Bit-fields, Enumerations,typedef.

**Files:**Introduction,UsingDataFilesinC,WorkingwithText Files,Random AccessestoFiles.

Atthe endof theModule5,studentswillbeableto:

1. Explainuserdefineddatatypeslikestructures andunions.**(BL-2)**
2. UnderstandtheconceptofSelf-ReferentialStructures.**(BL-2)**
3. Understandtheworkingoffiles.**(BL-2)**

| Totalhours: | 48HOURS |
|---|---|

**TextBook(s):**


1. PradipDey, andManasGhosh,"ProgramminginC", 2018, OxfordUniversityPress.
2. ByronGottfried,Schaum'sOutlineofProgrammingwithC,4th Edition, 2018,McGraw-Hill


**ReferenceBooks :**


1. R.G.Dromey,"HowtoSolveitbyComputer".2014,Pearson.
2. ComputerFundamentalsbyAnitaGoel,2010,PearsonPublication
3. BrianW. Kernighan, andDennisM.Ritchie,"TheCProgrammingLanguage", 2nd Edition,Pearson.
4. ProgramminginC,3/e:APracticalApproachbyAjayMittal,PearsonPublication
5. C:TheCompleteReferencebySCHILDTandHERBERT,McGrawHill,4th Edition,2020
6. Problem Solving with C by SOMASHEKARA, M. T., GURU, D. S., MANJUNATHA, K. S.,PHILearning,2nd Edition,2018
7. C HowtoProgram,PaulDeitel,Deitel& HarveyDeitel,6th Edition,PearsonEducation
8. ProgramminginCandDataStructures,JeriR.Hanly,ElliotB.Koffman,AshokKamthaneandA.Ananda Rao,PearsonEducation,1st Edition,2010.
9. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition Education / PHI,2009
10. ProgramminginC–StephenG. Kochan,4th Edition,PearsonEductaion,2015
11. ProgramminginANSIinC,EBalaguruswamy,Tata McGrawHill,8th Edition,2019
12. Computer ConceptsandProgramminginC, R.S.Salaria,KhannaPublishing, 2017
13. LetusC,YashavantP.Kanetkar,BBP Publications,Delhi, 16th Edition, 2017

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21ES1502 | COMMUNICATION SKILLS LAB | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credits | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| II | 0 | 0 | 2 | 48 | 1 | 40 | 60 | 100 |

CO – 1: To understand the communication concepts and to develop the students' competence in communication at an advanced level
CO – 2: To participate in Team activities that leads to the development of collaborative work skills
CO- 3: To develop strategies appropriately to improve Listening skills and Spoken Skills
CO – 4: To provide the knowledge on Presentation Skills , Group Discussion, Interview Skills and Resume Writing
CO-5: To improve skills to write resume, cover letter and Technical report

**TASK – 1**

**Class Room :**Introduction – Objectives & Characteristics of Technical Communication – Importance and need for Technical communication.
**Practice-1 :**Ice - Breaking Activity, Introducing Oneself and Others – Greetings – Taking Leave

**TASK – 2**

**Class Room :**Verbal& Non Verbal Communication - Interpersonal Communication in/with Groups – Barriers to effective Communication – Public Speaking Skills - Poster Presentation
**Practice-2 :**Role Plays – Just a Minute (JAM) – Conversation Practice
**Practice-3 :**Oral Description of Pictures, Photographs, Products, and Process – Poster Presentation

**TASK – 3**

**Class Room :**Listening Skills - Types of Listening Skills- Active listening and anticipating the speaker
**Practice-4 :**Listening for Specific & General Details- Listening Comprehension

**TASK – 4**

**Class Room :**Reading Skills: Skimming, Scanning, Intensive & Extensive reading – Debate : How to Debate, Tips for Debate, Debate Practice, Explanation of Debate Techniques, Debate Videos Presentation
**Practice-5 :**Debate (Planned & Extempore)
**Practice-6:** Reading comprehension- Skimming, Scanning, Intensive & Extensive reading

**TASK – 5**

**Class Room :**Scientific and Technical writing; Formal and Informal writing – Abstract Writing – Technical Report Writing– Resume Writing: Cover Letter, Resume Preparation
**Practice-7 :**Technical Report Writing
**Practice-8 :**Resume Writing

**TASK – 6**

**Class Room :**Presentation Skills Presentation techniques-tips of how to be an effective presenter-Preparation — how to deal with fear and anxiety - Voice, pace and gesture — how to speak, stand and move. Getting live feedback — how to interact with the audience
**Practice-9 :**Technical Report Writing
**Practice-10 :**Resume Writing

**TASK – 7**

**Class Room :**Group Discussion: What is Group Discussion, Types of Group Discussion, Tips and

Techniques for Effective Group Discussion, Group Discussion Videos Presentation – Interview Skills : Interview strategies, Interview questions, Successful Interview presentations
**Practice-11 :**Group Discussion (Planning & Extempore)
**Practice-12 :**Mock Interviews

**Text Book(s):**

1. Technical Communication: Principles and Practice by Meenakshi Raman&Sangeeta Sharma, OxfordUniversityPress.

**Reference Books:**


1. Effective Technical Communication by M. Ashraf Rizvi, Tata McGraw-Hill Publishing Company Ltd. 2005.
2. English Language Communication: A Reader cum Lab Manual byAnuradha Publications, Chennai, 2006. 4. Dr.ShaliniVerma, "Body Language- Your Success Mantra", S. Chand, 2006.
3. Business Communication today by Bovee, Till and Schatzman, Pearson

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21ES1505 | ENGINEERING & ITWORK SHOP | | | | | | | R21 |
| PART – A ENGINEERING WORK SHOP | | | | | | | | |
| Semester | Hours / Week | | | Total hrs | Credits | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| II | 0 | 0 | 4 | 64 | 2 | 40 | 60 | 100 |

**Pre-requisite:** Basic mathematics and electronic devices.

**Course Objectives:**

1. To know basic workshop processes and adopt safety practices while working with various tools and equipments
2. To identify, select and use various marking, measuring, holding, striking and cutting tools &equipments.
3. To know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
4. To gain knowledge about the usage of tools like Word processors, Spreadsheets, Presentations
5. To learn about Networking of computers and use Internet facility for Browsing and Searching

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO1** | **Understand** the safety aspects in using the tools and equipments.(BL-2) |
| **CO2** | **Apply** tools for making models in respective trades of engineering workshop.(BL-3) |
| **CO3** | **Apply** basic electrical engineering knowledge to makes implehousewiring circuits And check their functionality.(BL-3) |
| **CO4** | **Understand** to disassemble and assemble a Personal Computer and prepare the Computer ready to use(BL-2) |
| **CO5** | **Apply** knowledge to Interconnect two or more computers for information sharing (BL-3) |

| COURSE CONTENT (TRADES FOR PRACTICE) |
|---|
| **Trade -1 Carpentry (6 H)** |
| Familiaritywithdifferenttypesofwoodsandtoolsusedinwoodworkingandmakefollowingjointsfromoutof 300x40x25 mms of two od stock.<br>a) Half–Lapjoint.<br>b) Mortise and Tenonjoint |
| **Trade-2 Fitting (6 H)** |
| i.]Familiarity with different types of tools used in fitting and do the fitting exercises out of 80 x 50 x 5 mm M.S. stock<br>a) V-fit b) Dovetail fit |
| **Trade - 3 Sheet Metal Work (6 H)** |
| Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from out of 22 or 20 guage G.I. sheet<br>a) Tapered tray b) Conical funnel |
| **Trade - 4 Electrical House Wiring (6 H)** |
| Familiarities with different types of basic electrical circuits and make the following electrical connections<br>a) Two lamps in series<br>b) Two way switch<br>c) Tube light<br>d) Two lamps in parallel with 3 pin plug and switches |

| **Trade 5 - Welding** |
| --- |
| Familiarity with different types of tools used in welding and do the following welding exercises<br>1. Single V butt joint<br>2. Lap joint |
| **Text Book(s):**<br>1. Hajra Choudhury S.K., Hajra Choudhury A.K., Nirjar Roy S.K. "Elements of WorkshopTechnology"Vol-I2008&Vol-II2010MediaPromoters&Publishers Pvt.Limited,Mumbai.<br>2. KalpakjianS.andStevenS.Schmid,"Manufacturing Engineering and Technology" $4^{th}$Edition, Pearson Education IndiaEdition,2002.<br>3. P. Kannaiah&K. L. Narayana "Workshop manual" $2^{nd}$Ed., Scitech publications Pvt.Ltd.,Hyderabad,2008. |

| PART-B IT WORKSHOP LAB | |
|---|---|
| **Course Objectives:**<br>1. To provide Technical training on Productivity tools like Word processors, Spreadsheets, Presentations.<br>2. To make the students know about the internal parts of a computer, assembling, installing the operating system.<br>3. To teach connecting two or more computers. | |
| **Course Outcomes**: After successful completion of the course, the student will be able to: | |
| **CO 1** | Understand functionalities of a computer and operating system. (BL-2) |
| **CO 2** | Practice Word processors, Presentation and Spreadsheet tool. (BL-2) |
| **CO 3** | Connect computer using wired and wireless connections. (BL-2) |

| CO-PO Mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO | | | | | | | | | | | | PSO | |
| CO | 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 |
| CO1 | 1 | | | | | | | | | | | | | |
| CO2 | 1 | | | | | | | | | | | | | |
| CO3 | 1 | | | | | | | | | | | | | |
| 1: Low, 2-Medium, 3- High | | | | | | | | | | | | | | |

| COURSE CONTENT | CO |
|---|---|
| **Task-1 Learn about Computer (4H)** | |
| Identify the internal parts of a computer and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report. | CO 1 |
| **Task -2 Assembling a Computer (4H)** | |
| Disassemble and assemble the PC back to working condition. Troubleshoot the computer and identify working and non-working parts. Identify the problem correctly by various methods available (eg: beeps). Record the process of assembling and trouble-shooting a computer. | CO 1 |
| **Task-3 Install Operating system (2H)** | CO 1 |
| Install Linux, any other operating system (including proprietary software) and make the system dual boot or multi boot. Record the entire installation process. | |
| **TASK-4 Operating system features (2H)** | CO 1 |
| Record various features that are supported by the operating system(s) installed. Submit a report on it. Access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Install new application software and record the installation process. | |
| **TASK-5 Word Processor (6H)** | CO 2 |
| Create documents using the word processor tool. Tasks to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting | |

| | |
|---|---|
| paragraphs, spell checking, etc. Prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Submit a report of the word processor considered.<br>Create documents using the word processor tool. Mail Merge in word processor for creating appointment orders for 10 employee records in excel. | |
| **TASK-6 Spreadsheet (4H)** | CO 2 |
| To create, open, save the spreadsheet and format them as per the requirement. Some of the tasks to be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells, working with pivot tables and charts. Submit a report of the Spreadsheet application considered. | |
| **TASK-7 Presentations (6H)** | CO 2 |
| To create, open, save and run the presentations, Select the style for slides, format the slides with different fonts, colors, create charts and tables, insert and delete text, graphics and animations, bulleting and numbering, hyperlink, set the time for slide show, Record slide show. Submit a report of the Presentation tool considered. | |
| **TASK-8 Wired network & Wireless network (4H)** | CO 3 |
| Select a LAN cable, Identify the wires in the cable, Define the purpose of each wire, Study the RJ45 connecter, Use crimping tool to fix the cable to the connecter, Test the cable using LAN tester, Connect two or more computers using cross and straight cables, Configure the computers, share the data between the computers. | |

| | |
|---|---|
| **Additional Experiments:** | |
| **TASK -1 IoT** | CO 3 |
| Raspberry Pi Study the architecture of Raspberry pi, configure software, Install SD card, Connect the cables, Install Raspbian (or any other) operating system, Configure Wi-Fi, Remotely connect to your Raspberry Pi. | |
| **TASK -2 OUTLOOK, MACROS** | CO 3 |
| Practice the following tasks and submit report<br>A. Configure outlook and access mails.<br>B. Create Macros in word and spreadsheet tools | |
| | |

**Text Book(s):**

1. B.Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance",2nd edition, Tata McGraw-Hill, 2002
2. "MOS study guide for word, Excel, Powerpoint& Outlook Exams", Joan Lambert, Joyce Cox, PHI.
3. "Introduction to Information Technology", ITL Education Solutions limited, Pearson Education.

**Reference Book(s):**

1. Rusen, "Networking your computers and devices", PHI
2. Bigelows, "Trouble shooting, Maintaining & Repairing PCs", TMH.

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21ES1502 | **BASIC ELECTRICAL ENGINEERING LAB** | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| I | 0 | 0 | 2 | 32 | 1 | 40 | 60 | 100 |

**Pre-requisite:** Basic knowledge of Electrical circuits and Machines

**Course Objectives:**

1. To Verify the KCL, KVL and Network Theorems
2. To conduct testing on DC and AC Machines. .

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | Solve the given electrical circuit using basic Kirchhoff's laws and network theorems (BL-3) |
| **CO 2** | Analyze the simple DC circuits using Pspice(BL-3) |
| **CO 3** | Determine the performance characteristics of DC Machines. (BL-3) |
| **CO 4** | Determine the performance of single phase transformer & three phase Induction motor(BL-3) |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **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** |
| **CO1** | 3 | 2 | 1 | | | | | | | | | | 2 | 3 |
| **CO2** | 2 | 2 | 2 | | | | | | | | | | 2 | 3 |
| **CO3** | 3 | 2 | 2 | | | | | | | | | | 2 | 3 |
| **CO4** | 3 | 3 | 2 | | | | | | | | | | 2 | 3 |

1: Low, 2-Medium, 3- High

| COURSE CONTENT | CO |
|---|---|
| **PART-A** | |
| **Task 1 - Verification of Kirchhoff laws.** | |
| Objectives:<br>a) To Verifythe KCL<br>b) To Verify the KVL | CO 1 |
| **Task-2 Verification of Thevenin's and Norton's theorems** | |
| Objective: a) To Verify the Thevenin's and Norton's Theorem | CO 1 |
| **Task-3Verification of Superposition Theorem** | |
| Objective: a) To Verify the Superposition Theorem | CO 1 |
| **Task-4Verification of Maximum Power Transfer Theorem** | |
| **Objective:**<br>To verify the Maximum power transfer theorem | CO 1 |
| **Task 5 Verification of Reciprocity and Millman's Theorems** | |
| **Objective:**<br><br>To verify the reciprocity and Millman's Theorems | CO 1 |
| **TASK-6 Verification of Compensation Theorem** | |

| | |
|---|---|
| **Objective:**<br><br>To verify the compensation theorem | CO 1 |
| **Task 7 -Brake Test on DC shunt Motor.** | |
| **Objectives:**To determine the performance characteristics,<br><br>a) Efficiency Vs Output<br><br>b) Line current Vs Output<br><br>c) Speed Vs Output<br>d) Torque Vs Output | CO 3 |
| **Task 8 -Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed** | |
| **Objectives**:<br>a) Predetermine the OCC at different speeds<br>b) Determine the critical field resistance<br>c) Obtain critical speed for a given shunt field resistance | CO 3 |
| **Task 9-O.C. & S.C. Tests on Single Phase Transformer.** | |
| **Objectives:** Predetermination of the following<br>a) Efficiency at different load conditions and different power factors<br>b) Regulation at different load conditions and different power factors<br>c) Output vs. Efficiency curves | CO 4 |
| **Task 10 -Brake Test on Three Phase Induction Motor.** | |
| **Objectives:**To determine the performance characteristics,<br><br>a) Efficiency Vs Output<br><br>b) Line current Vs Output<br><br>c) Speed Vs Output<br>d) Torque Vs Output | CO 4 |
| **Task 11 - Simulation of DC Circuit using mesh analysis** | |
| **Objectives:** To simulate a simple DC circuits using PSpice | CO 2 |
| **Task 12 -Simulation of DC Circuit using nodal analysis** | |
| **Objectives:**To simulate a simple DC circuits using PSpice | CO 2 |


**Text Book(s):**

1. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", TMH, 5th Edition, New Delhi, 2015.

2.Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press..

**Reference Book(s):**

1.S.Sivanagaraju, G.Kishor&C.Srinivasa Rao, "Electrical Circuit Analysis", Cengage Learning, 1st Edition, 2010.

2. A .Chakrabarti : Circuit Theory (Analysis and Synthesis), Dhanpat Rai &Co

3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013
4. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004
5. Ravish R., Network Analysis and Synthesis, 2/e, McGraw-Hill, 2015.

| NARAYANA ENGINEERING COLLEGE::GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21CH1001 | CHEMISTRY | | | | | | | R21 |
| **Semester** | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| II | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

**Pre-requisite:** Basic concepts in chemistry, Advanced engineering materials,chemistry in day to day life,Fossil fuels

**Course Objectives:**

1. To impart technological aspects of modernchemistry and itsapplications.
2. Understand the chemistry behind electrochemical energysystems.
3. To train the students on the principles and applications of polymers.
4. To acquire knowledge of engineering materials and fuels.

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | **Understand** the **fundamental concepts of chemistry to predict the structure and bonding of materials**.**(BL-2)** |
| **CO 2** | **Discuss** various kinds of **electro chemical cells**.**(BL-3)** |
| **CO 3** | **Compare** the **materials of various energy storage devices and emerging technologies**.**(BL-3)** |
| **CO 4** | **Demonstrate** the **mechanism and applications of different polymers in electronicdevices**.**(BL-3)** |
| **CO 5** | **Explain calorific values, refining of petroleum and cracking of oils**.**(BL-2)** |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| CO1 | 3 | | | | | | | | | | | | | |
| CO2 | 3 | | | | | | | | | | | | | |
| CO3 | 3 | | | | | | 3 | | | | | | | |
| CO4 | 3 | | | | | | 3 | | | | | | | |
| CO5 | 3 | | | | | | 3 | | | | | | | |

**1: Low, 2-Medium, 3- High**

## COURSE CONTENT

| MODULE – 1 | Structure and Bonding Models | 10 Hrs |
|---|---|---|

**Structure and Bonding Models:** Dual nature of matter- De Broglie's equation, Schrodinger wave equation, Molecular orbital theory – bonding in homo and hetero nuclear diatomic molecules– energy level diagrams of $O_2$and CO, etc. π-molecular orbital's of butadiene and benzene, calculation of bond order and magnetic properties, Crystal field theory – salient features – splitting in octahedralandtetrahedralcomplex.

At the end of the Module 1, student will be able to:

1.**Understand** the fundamental concepts of chemistry to predict the structure, properties and

bonding of Engineering materials**.(BL-2)**

**2.Explain** the calculation of bond order of $O_2$ and Co molecules**.(BL-2)**

**3.Discuss** the magnetic behavior and colour of coordination compounds**.(BL-2)**

| MODULE -2 | Electro Chemistry | 10 Hrs |
|---|---|---|

**Electro chemistry:** Electrode potential, EMF of an electrochemical cell, Nernst equation, Electrodes – concepts, reference electrodes (standard hydrogen, Calomel electrode, and glass electrode), potentiometry-potentiometric titrations (red ox titrations), concept of conductivity, conductometric titrations (acid- base titrations). PV Cell and its applications.

At the end of the Module 2, students will be able to:

1. **Demonstrate** competency in the basic concepts of electrochemical cells. **(BL-3)**
2. **Explai**n the significance of electrode potentials. **(BL-2)**
3. **List** the different types of electrodes. **(BL-1)**
4. **Differentiate** between Potentiometric and conductometric titrations. **(BL-2)**
5. **Illustrate** the construction of PV cell. **(BL-3)**

| MODULE-3 | Battery Technology | 09 Hrs |
|---|---|---|

**Battery Technology**:Introduction, classification of batteries, Important applications of batteries, Modern batteries- zinc-air, lithium cells,Li- $MnO_2$ cell, Ni-Cd cell, lead acid storage cell. Fuel cells- Introduction – classification, hydrogen - oxygen fuel cell, methanol - oxygen fuel cell, SOFC - Merits and demerits of fuel cell.

At the end of the Module 3, students will be able to:

1. **Classify** batteries into different types.**(BL-3)**
2. **Explain** the concept involved in the construction of batteries.**(BL-2)**
3. **Identify** the significance of batteries**.(BL-1)**
4. **Compare** the merits of different fuel cells.**(BL-2)**

| MODULE-4 | Polymer Chemistry | 10 Hrs |
|---|---|---|

**Polymer Chemistry:**Introduction topolymers, polymerization, types of polymerization, mechanism of polymer formation. Plastics - Thermoplastics and Thermosetting, Preparation, properties and applications of –PVC,PTFE, Bakelite, Urea- formaldehyde resin, Nylons. Natural Rubber, processing, vulcanization. Elastomers–Buna-S, Buna-N–preparation, properties and applications. Conducting polymers – poly acetylene, poly aniline, mechanism of conduction and applications.

At the end of the Module 4, students will be able to:

1. **Identify** different types of polymers. **(BL-1)**
2. **Distinguish** between thermoplastic and thermo setting resins. **(BL-2)**
3. **Explain** the preparation, properties and applications of some plastic materials. **(BL-2)**
4. **Apply** the knowledge of advanced polymers, conducting polymers for different Applications. **(BL-3)**

| MODULE-5 | Fuel Technology | 09 Hrs |
|---|---|---|

**Fuel Technology:** Introduction, Types of fuels, characteristics of good fuel, units, calorific value, HCV &LCV,Solid fuels, Analysis of coal-proximate and ultimate. Liquid Fuels: refining of petroleum, synthetic petrol preparation by Fischer- tropschProcess,Gaseousfuels;Naturalgas,watergas,producer gas and coal gas.

At the end of the Module 5, students will be able to:

1. **Differentiate** petroleum, petrol, synthetic petrol and have knowledge how they areproduced. **(BL-2)**
2. **Select** suitable fuels for IC engines. **(BL-1)**
3. **Explain** calorific values, octane number, refining of petroleum and cracking of oils.**(BL-2)**

| **Total hours:** | **48 Hours** |
|---|---|

**Text Book(s):**

1.P.C.Jain&MonikaJain,*EngineeringChemistry*,DhanpatRayPublishingCompany (P) Ltd, New Delhi, 16th edition, 2013.
2.K. N. Jayaveera, G. V. Subba Reddy and C. Ramachandraiah, *Engineering Chemistry*, McGraw Hill Publishers, New Delhi.
3.Energy scenario beyond2100,byS.Muthu Krishna Iyer.

**Reference Book(s):**

1.J. D. Lee, *Concise Inorganic Chemistry*, Oxford University Press, 5th edition2010.
2.Skoog and West, *Principles of Instrumental Analysis*, Thomson, 6th edition,2007.
3.Peter Atkins, Julio de Paula and James Keelar, *Atkins' Physical Chemistry*, Oxford University Press, 10th edition,2010.

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21CH1501 | CHEMISTRY LAB | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| II | 0 | 0 | 3 | | 1.5 | 40 | 60 | 100 |
| **Pre-requisite: Nil** | | | | | | | | |
| **Course Objectives:** Theobjectiveofthelaboratorysessionsistoenablethelearnerstogethands-onexperienceontheprinciples discussed in theory sessions and to understand the applications of these concepts inengineering. | | | | | | | | |
| **Course Outcomes**: After successful completion of the course, the student will be able to: | | | | | | | | |
| **CO 1** | **Determine** the cell constant and conductance of solutions | | | | | | | |
| **CO 2** | Perform quantitative analysis using instrumental methods | | | | | | | |
| **CO 3** | Utilize the fundamental laboratory techniques for analyses such as titrations, separation purification and Spectroscopy | | | | | | | |
| **CO 4** | Analyze and gain experimental skill. | | | | | | | |

| CO-PO Mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO** | **PO** | | | | | | | | | | | | **PSO** | |
| | **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** |
| **CO1** | 3 | | | | | | | | | | | | | |
| **CO2** | 3 | | | | | | | | | | | | | |
| **CO3** | 3 | | | | | | | | | | | | | |
| **CO4** | 3 | | | | | | | | | | | | | |
| 1: Low, 2-Medium, 3- High | | | | | | | | | | | | | | |

| COURSE CONTENT | CO |
|---|---|
| **Task-1:** Estimation of Ferrous Ion by using Potassium Dichromate | |
| **Objective:**<br>1. Determine the percentage of ferrous iron in an unknown sample by redox titration with potassium dichromate solution.<br>2.The student will pre-treat the sample to obtain the iron in the reduced (+2 oxidation) state.<br>3.The student will use a solution of primary standard as the titrant | CO 3 |
| **Task-2:** Conductometrictitration of Weakacid vs. Strong base | |
| **Objective:**<br>1.Perform a conduct metric titration of Weak acid with a strong base,<br>2. Determine the equivalence point of the titration by plotting titration curve using conductance values and amount of the base added during titration,<br>3. State the advantages conduct metric titrations. | CO 2 |
| **Task-3 :** Conductometrictitration of strong acid vs. strong base | |
| **Objective:**<br>1.Perform a conductometric titration of strong acid with a strong base,<br>2. Determine the equivalence point of the titration by plotting titration curve using conductance values and amount of the base added during titration,<br>3. State the advantages conduct metric titrations. | CO2 |
| **Task-4 :** Determination of cell constant and conductance ofsolutions | |

| | |
|---|---|
| **Objective:**<br>1. To determine conductivity of the given water sample. by using conductivity meter<br>2. To understand the specific conductance. | CO 1 |
| **Task-5 :**Potentiometry - Determination of red-ox potentials andemfs | |
| **Objective:**<br>1. Determine the concentration of an unknown iron(II) solution. By using potentiometer<br>2. Discuss how the potential changes with relative concentration of oxidised/reduced from,<br>3. Perform a red-ox titration of ammonium iron (II) sulphate using potassium dichromate as oxidizing agent,<br>4. Determine the equivalence point of the redox titration by plotting titration curve using potential change values and amount of oxidizing agent added during titration | CO 3 |
| **Task-6 :** Determination of Strength of an acid in Pb-Acidbattery | |
| **Objective:**<br>1. To determine the half –reactions involved in spontaneous oxidation –reduction reactions.<br>2. Explain the function of the lead storage and dry cell batteries …electrolysis involving two lead strips immersed in sulfuric acid. | CO 4 |
| **Task-7 :**Preparation of aBakelite | |
| **Objective:**To prepare phenol formaldehyde resin. (Bakelite)<br>1. Understand the differences between linear and cross linked polymers.<br>2. Compare and contrast the recycling properties of linear and cross linked polymers.<br>3. Compare the combustion properties of various types of material.<br>4. Define the following terms: polymer, monomer, repeat unit, cross linking, biopolymer | CO 4 |
| **Task-8:** Determination of percentage Moisture content in a coalsample | |
| **Objective:**<br>**1.**To provide practical knowledge for developing experimental skill in using desicator to estimate moisture content in coal<br>**2.** Understand percentage of moisture in Coal sample. | CO4 |
| **Task-9:**Determination of percentage of Iron in Cement sampleby colorimetry | |
| **Objective:**1.To use spectroscopy to relate the absorbance of a colored solution to its concentration.<br>2. To prepare a Beer's Law Plot to determine the concentration of an unknown. | CO 2 |
| **Task-10:**Estimation of Copper by complexo metric method | |
| **Objective:**<br>1. Determine the percentage of Copper in an unknown sample by Complex metric titration with EDTA solution.<br>2.The student will pre-treat the sample to obtain the Copper in the reducedstate**.**<br>3.The student will use a solution of primary standard as the titrant | CO 3 |

| | |
|---|---|
| **Additional Experiments:** | |
| **Task-11 :**Determination of hardness of ground water sample | |
| **Objective**<br>**1.**Determine the total hardness (total calcium and magnesium ion concentration).<br>2. Learn how to titrate with EDTA solution.<br>3.Determine permanent hardness and the temporary hardness | CO1 |
| **Task-12:** pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strongbase | |

| **Objective:** | |
|---|---|
| 1. To perform apHmetric titration of an acidic solution of known molarity.<br>2. To graph the volume of base added vs. the pH and to determine the equivalence point<br>3. To calculate the morality of the basic solution | CO 2 |

**Text Book(s):**

**1.**A Textbook of Quantitative Analysis, Arthur J. Vogel.

2. Jain & Jain. Engineering Chemistry: Dhanapathrai Publications.,2015.

3.S.S.Dara, Experiments and Calculations in Engineering Chemistry: S-Chand Publications, Revised Edition,2008.

**Reference Book(s):**

1. S.K. Bhasin and Sudha Rani, "Laboratory Manual on EngineeringChemistry", Dhanpat Rai Publishing Company, New Delhi, 2nd edition.
2. Sunitha Rattan, "Experiments in Applied Chemistry", S.K. Kataria& Sons,New Delhi, 2nd edition.

| NARAYANA ENGINEERING COLLEGE: GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21MA1004 | VECTOR CALCULUS & TRANSFORMS | | | | | | | R-21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| II | 3 | 1 | 0 | 64 | 4 | 40 | 60 | 100 |

**Pre-requisite**: inter mathematics

**Course Objectives:** This course aims to providing the knowledge for the student about on

1. To enlighten the learners in the concept of vector differentiation and integration.
2. To illustrate the physical interpretation of gradient, divergence and curl
3. To understand the concepts of Laplace transforms and its properties.
4. To apply the concepts of Laplace, transform to solve the ordinary differential equations.
5. To understand the concepts of Fourier seriesand apply its applications in engineering.
6. To understand the concepts of Fourier transforms and applyits applications in engineering.

**Course Outcomes**: After successful completion of the course, the student will able to:

| | |
|---|---|
| **CO 1** | Interpretate the different operators such as gradient, curl and divergence to find out point function (L-3) |
| **CO 2** | evaluate area and volumes by Apply the fundamental theorems (L-5) |
| **CO 3** | ApplyLaplace and Inverse Laplace transforms techniques to solve the differential equations and its application (L-3) |
| **CO 4** | Develop the Fourier Series to the given periodic functions (L-3) |
| **CO 5** | Apply the concepts of Fourier transforms to Find impulse(L-3) |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | 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 |
| CO1 | 3 | 3 | | | | | | | | | | | | |
| CO2 | 3 | 3 | | | | | | | | | | | | |
| CO3 | 3 | 3 | | | | | | | | | | | | |
| CO4 | 3 | 3 | | | | | | | | | | | | |
| CO5 | 3 | 3 | | | | | | | | | | | | |

1- Low, 2-Medium, 3- High

**COURSE CONTENT**

| MODULE – 1 | Vector Differentiation | Hours: 12h(9L+3T) |
|---|---|---|

Scalar and vector point functions, vector operator del, del applies to scalar point functions Gradient, del applied to vector point functions-Divergence and Curl, vector identities (without proof)

At the end of the Module 1, students will be able to:

1. Apply del to Scalar and vector point functions (L-3)
2. Illustrate the physical interpretation of Gradient, Divergence and Curl (L-2)
3. Apply del to scalar and vector point functions. (L-3)
4. Illustrate the physical interpretation of gradient, divergence and curl. (L-2)
5. Calculate directional derivatives and gradients (L-1)

| MODULE -2 | Vector Integration | Hours:12h(9L+3T) |
|---|---|---|

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

At the end of the Module 2, students will be able to:

1. Find the work done in moving a particle along the path over a force field (L-1)
2. Evaluate the rates of fluid flow along and across curves (L-5)
3. Evaluation of surfaceareas integrals by applying Green`s theorems.(L-5)
4. Evaluation of volume integrals by applying Gauss theorems (L-5)
5. Evaluation of line integrals by applying Stokes theorems.(L-5)

| **MODULE-3** | **Laplace and Invers Laplace Transforms** | **Hours:16h(12L+4T)** |
|---|---|---|

Definition-Laplace transform of standard functions-existence of Laplace Transform Inverse transform – First shifting Theorem, transforms of derivatives and integrals – Unit step function Second shifting theorem – Dirac's delta function – Convolution theorem Laplace transform of Periodic function. Differentiation and integration of transform solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

At the end of the Module 3, students will be able to:

1. Understand the concept of Laplace transforms and find the Laplace transforms of elementaryfunctions.(L-3)
2. Find the Laplace transforms of general functions using itsproperties.(L-2)
3. Understand Laplace transforms of special functions (Unit step function, Unit Impulse & Periodic.

   (L-3)
4. Apply Laplace transforms to solve DifferentialEquations.(L-3)

| **MODULE-4** | **Fourier Series** | **Hours:12h(9L+3T)** |
|---|---|---|

Determination of Fourier coefficients (Euler's)–Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions Fourier series in an arbitrary interval–Half-range Fourier sine and cosine expansions.

At the end of the Module 4, students will be able to:

1. Understand Fourier series expansion of the givenfunction. (L-3)
2. Determine Fourier coefficients (Euler's) and identify existence of Fourier series of the givenfunction. (L-3)
3. Expand the given function in Fourier series given in Half rangeinterval. (L-3)
4. Apply Fourier series to establish Identities among Euler coefficients. (L-3)

| **MODULE-5** | **Fourier Transform** | **Hours:12h(9L+3T)** |
|---|---|---|

Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourierintegral.Fouriertransform–Fouriersinandcosinetransforms Properties–Inverse transforms– Finite Fourier transform and Inverse Finite Fourier transform.

At the end of the Module 5, students will be able to:

5. Understand the concepts of Fourier transforms. (L-2)
6. Apply the properties of Fourier transforms to various engineering problems. (L-3)
7. Apply the concepts of Fourier transforms to Find impulse. (L-3)
8. Make use of the Fourier transforms and its inverse in practical applications of electronics engineering. (L-3)

| **Total hours** | **64** |
|---|---|

**Text Book(s):**


1. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers.
2. N.P. Bali and Manish Goyal, “A Text Book of Engineering Mathematics”, Laxmi Publication.
3. Ramana B.V., “Higher Engineering Mathematics”, McGraw Hill Publishers.


**Reference Book(s):**


1. Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley.
2. Veerarajan T., “Engineering Mathematics”,Tata McGraw-Hill.
3. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.


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| NARAYANA ENGINEERING COLLEGE::GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21ES1005 | PYTHON PROGRAMMING AND DATA SCIENCE | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| II | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

**Pre-requisite: Basics of programming Language.**

**Course Objectives:**

1. To learn about Python programming language syntax, semantics, and the runtime environment
2. To be familiarized with general computer programming concepts like conditional execution, loops & functions
3. To learn about mutable and immutable types.
4. To learn about the data science related functions in NUMPY.
5. To solve data science problems using PANDAS.

**Course Outcomes**: After successful completion of the course, Student will be able to

| | |
|---|---|
| **CO 1** | Demonstrate various **operators, data types and decision structures** in python. (BL - 3) |
| **CO 2** | Solve problems using **Functions and data structures** in Python (BL - 3) |
| **CO 3** | Implement the concept of **Files and Modules** (BL - 3) |
| **CO 4** | Implement Data Science queries using **NUMPY** module (BL - 3) |
| **CO 5** | Solve data manipulation task using **PANDAS** module (BL - 3) |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| CO1 | 3 | 1 | | | | | | | | | | | 1 | |
| CO2 | 2 | 2 | | | | | | | | | | | 2 | |
| CO3 | 2 | 1 | | | | | | | | | | | 2 | |
| CO4 | 2 | 2 | | | | | | | | | | | 1 | |
| CO5 | 2 | 2 | | | | | | | | | | | 1 | 1 |

1: Low, 2-Medium, 3- High

**COURSE CONTENT**

| MODULE – 1 | I/O and Decision Structures | 10H |
|---|---|---|

**Input and Output**: Introduction to Python and installation, Input and Output, Comments, Variables, Operators. Type conversions, Expressions, Data types.

**Decision Structures and Boolean Logic**: if, if-else, if-elif-else Statements, Nested Decision Structures. Looping: while loop, for loop, Nested Loops.

At the end of the Module 1, students will be able to:

1. **Describe** python expressions, data types (BL-2)
2. **Perform** various Arithmetic calculations using Operators in Python(BL-3)

| | | |
|---|---|---|
| **3. Demonstrate** the usage of looping structures in python Language.(BL-3) | | |
| **MODULE -2** | **Functions and Data structures** | 10H |
| **Functions:** Definition, Function Arguments, Anonymous Function, Scope of the variable and namespacing, Recursion, Map, Filter and Reduce Functions<br>**Strings**, **Lists, Tuples and Dictionaries**: String Methods and Operations, Lists: Operations and Methods, Tuples: Operations and Methods, Dictionaries: Operations and Methods. | | |
| At the end of the Module 2, students will be able to:<br>1. **ImplementFunctions** to solve problems.(BL-3)<br>2. **Describe** various **String** handling functions in python(BL-2)<br>3. **Describe** the various **Lists, Tuples and Dictionaries** in python(BL-2) | | |
| **MODULE-3** | **Files and Modules** | 10H |
| **Files:** Text Files, File Operations, File Functions, Copying the Files, Two Files Merging into Single File.<br>**Modules:** Modules, Standard Modules, Packages. | | |
| At the end of the Module 3, students will be able to:<br>1. Describe the concepts of Files (BL-2).<br>2. Describe the importance of Modules and packages (BL-2). | | |
| **MODULE-4** | **Introduction to Numpy** | 9H |
| **Introduction to Numpy**: Fixed-Type Arrays in Python, Creating Arrays from Lists, Creating Arrays from Scratch Numpy Standard Data Types, The Basics of Numpy Arrays, Numpy Array Attributes.<br>**Array Indexing**: Accessing Single Elements, Array Slicing: Accessing Subarrays, Reshaping of Arrays, Array Concatenation and Splitting. Computation on Numpy Arrays: Universal Functions. | | |
| At the end of the Module 4, students will be able to:<br>1. Describe the concept of **Numpy**Module(BL-2)<br>2. Solve numerical problems related to data science using **NumpyArrays.(BL-3)**<br>3. Apply **Universal Functions** for Data Science problems(BL-3) | | |
| **MODULE-5** | **Data Manipulation with Pandas** | **9H** |
| **Data Manipulation with Pandas**: Installing and Using Pandas, Introducing Pandas Objects, Pandas Series Object, Pandas DataFrame Object, Pandas Index Object, Data Indexing and Selection Data Selection in Series.<br>**Data Selection in DataFrame Operating on Data in Pandas Ufuncs**: Index Preservation UFuncs: Index Alignment, Operations Between DataFrame and Series, Handling Missing Data, Trade-Offs in Missing Data Conventions, Missing Data in Pandas, Operating on Null Values. | | |
| At the end of the Module 5, students will be able to:<br>1. Describe the concept of **Data Manipulation** (BL-2).<br>2. Describe the concept of **Pandas** for Data Science(BL-2)<br>3. Apply Ufunctions in pandas to generate **DataFrame**(BL-3)<br>4. Implement Pandas Module to handle **Missing Data**(BL-3) | | |
| | **Total hours:** | **48 HOURS** |

**Text Books:**

1. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2. Python Data Science Hand Book, Jake Vanderplas, First Edition, Oreilly

**Reference Book(s):**

1. Introduction to Python Programming, Gowrishankar. S, Veena A, CRC Press.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
3. Python for Data Analysis-Wes McKinney, 2nd-Edition, Oreilly.
4. Python Programming: A Modern Approach, Vamsi Kurama, Pearson. Braun W. J., Murdoch D. J., A First Course in Statistical Programming with R, Cambridge University Press, 2007

# NARAYANA ENGINEERING COLLEGE:GUDUR

| 21ES1508 | Python Programming and Data Science Lab | | | | | | R21 |
|---|---|---|---|---|---|---|---|
| **Semester** | **Hours / Week** | | | **Total hrs** | **Credit** | **Max Marks** | |
| | **L** | **T** | **P** | | **C** | **CIE** | **SEE** | **TOTAL** |
| II | 0 | 0 | 2 | 32 | 1 | 40 | 60 | 100 |

**Pre-requisite:** Programming Knowledge

**Course Objectives:**

1. To gain knowledge on python program basics
2. To prepare students for building programsusingcontrol statements
3. To prepare students for solving the problems involving functions and files.
4. To gain knowledge Python Numpy module to solve complex mathematical problems involving matrices.
5. To gain Knowledge of data cleaning using Pandas.

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO1** | Understanding and use of python- Basic Concepts**(BL -2)** |
| **CO2** | Solve the problems using pythonIterative Statements**(BL -3)** |
| **CO3** | Understand the concepts of files, modules**(BL -2)** |
| **CO4** | Solve the Numerical problems that involve Matrices**(BL -3)** |
| **CO5** | Provide solutions for data cleaning tasks**(BL-3)** |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **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** |
| **CO1** | 1 | 1 | 2 | | | | | | | | | | 1 | |
| **CO2** | 2 | 3 | 2 | 2 | | | | | | | | | 2 | 1 |
| **CO3** | 2 | 2 | 3 | 2 | 2 | | | | | | | | 3 | 2 |
| **CO4** | 2 | 2 | 2 | 1 | 1 | | | | | | | | 3 | 2 |

1-Low, 2-Medium, 3- High

| **COURSE CONTENT** | **CO** |
|---|---|
| **Task-1 - Python Basics (4 H)** | |
| 1. Running instructions in Interactive interpreter and a Python Script<br>2. Write a program to purposefully raise Indentation Error and Correct it<br>3. Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)<br>4. Write a program to convert a Binary number to Decimal number and verify if it is a Perfect number. | CO 1 |
| **Task-2 - Conditional Statements (2 H)** | |
| 1. Write a program to determine if a given string is a Palindrome or not<br>2. Write a program for Fibonacci sequence is generated by adding the previous two terms by starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, | CO 1 |
| **TASK-3 - Functions (2 H)** | |
| 1. Write a function that draws a Pyramid with # symbols<br>#<br># # #<br># # # # #<br># # # # # # #<br>2. Choose any five built-in string functions of C language. Implement them on your | CO 2 |

| | |
|---|---|
| own in Python. You should not use string related Python built-in functions. | |
| **TASK-4 -Strings (4H)** | |
| 1. Write a program to use split and join methods in the string and trace a birthday with Dictionary data structure.<br>2. Write a program using map, filter and reduce functions | CO 2 |
| **TASK-5 - Lists (2H)** | |
| 1. Write program which performs the following operations on lists. Don't use built-in functions<br>a) Updating elements of a list<br>b) Concatenation of list's<br>c) Check for member in the list<br>d) Insert into the list<br>e) Sum the elements of the list<br>f) Push and pop element of list<br>g) Sorting of list<br>h) Finding biggest and smallest elements in the list<br>i) Finding common elements in the list | CO 2 |
| **TASK-6 -Files (4H)** | |
| 1. Write a program to read the file content and count the number of vowels, consonants, digits and special characters in a given file.<br>2. Write a program to perform the following operations in Files:<br>a. Copy from one file to another file<br>b. Merge two files | CO3 |
| **TASK-7 –- Introduction to Numpy (4 H)** | |
| 1. Write a NumPy program to compute the outer product of two given vectors.<br>2. Write a Numpyprogram to compute the determinant of a given square array. | CO 4 |
| **TASK-8 - Introduction to Numpy (2H)** | |
| 1. Write a Numpy program to calculate the difference between the maximum and the minimum values of a given array along the second axis.<br>Expected Output:<br>Original array:<br>[[ 0 1 2 3 4 5]<br>[ 6 7 8 9 10 11]]<br>Difference between the maximum and the minimum values of the said array:<br>[5 5] | CO 4 |
| **TASK-9 - Introduction to Pandas(4 H)** | |
| 1. Write a Pandas program to convert a Panda module Series to Python list and it's type.<br>2. Write a Pandas program to display most frequent value in a given series and replace everything else as 'Other' in the series | CO 5 |
| **TASK-10 - Introduction to Pandas (4 H)** | |
| 1. Write a Pandas program to identify the column(s) of a given DataFrame which have at least one missing value.<br>2. Write a Pandas program to replace NaNs with a single constant value in specified columns in a DataFrame. | CO 5 |

| ADDITIONAL EXPERIMENTS | |
|---|---|
| **TASK – 11 – Lists, Strings, Tuples** | |
| 1. Write a python programs on lists<br>2. Write a python program on strings<br>3. Write a python program on tuples | CO2 |
| **TASK – 12 - Pandas** | |
| 1. Write a Pandas program to interpolate the missing values using the Linear Interpolation method in a given DataFrame.<br>2. Write a Pandas program to import excel data (coalpublic2013.xlsx) into a Pandas DataFrame. | CO5 |

**Text Book(s):**


1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2017
2. Learning Python, Mark Lutz, Orielly, 5th Edition, 2013


**Reference Book(s):**


1. Think Python, Allen Downey, Green Tea Press, 2nd Edition
2. Core Python Programming, W.Chun, Pearson, 2nd Edition, 2007
3. Fundamentals of Python, Kenneth A. Lambert, Cengage Learning, 1st Edition, 2015
4. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019
5. Allen B. Downey, "Think Python", 2ndEdition, SPD/O'Reilly, 2016
6. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
7. Michael Dawson, —Python Programming for absolute beginners, 3rd Edition, CENGAGE Learning Publications, 2018.
8. Taming Python by Programming, Jeeva Jose,Khanna Publishing House, 1st Edition, 2018
9. Introduction to Computing and Problem Solving with Python, J. Jose, Khanna Publications, 1st Edition, 2019.
10. Guido Van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21ES1501 | **ENGLISH LANGUAGE LAB**<br>**Common to all Branches (CSE,ECE,EEE,CE,ME)** | | | | | | | R21 |
| **Semester** | **Hours / Week** | | | **Total hrs** | **Credit** | **Max Marks** | | |
| | **L** | **T** | **P** | | **C** | **CIE** | **SEE** | **TOTAL** |
| II | 0 | 0 | 3 | 48 | 1.5 | 40 | 60 | 100 |

CO-1: To expose the students to develop knowledge and awareness of English speech sounds, word accent, intonation and rhythm
CO-2: To sensitize the students to the nuances of English speech sounds, word accent, intonation and thythm
CO-3: To develop strategies appropriately to improve Listening skills and Spoken Skills
CO-4: T o improve the descriptive strategies and presentation styles
CO-5: To distinguish main ideas and specific details and make use of contextual clues to infer meanings of unfamiliar words from context.
CO-6: To improve the skills to exhibit the main ideas in the poster

**TASK – 1**

Introduction to Phonetics: Introduction to Sounds of Speech – Vowels – Consonants.

**Practice-1:** Listening Soundsof Speech – Vowels – Consonants with a focus on pronunciation
**Practice-2:** Highlighting the sounds of Vowels and Consonants

**TASK – 2**

Syllabification: Word Stress, Rules of word stress

**Practice-3** : Practice on Intonation and Stress

**TASK – 3**

Listening Skills : Types of Listening Skills- Active listening and anticipating the speaker

**Practice-4 :**Listening for Specific & General Details

**Practice-5 :**Listening Comprehension

**TASK – 4**

Defining & Describing: Objects, Places and Events- Video Speech Writing- Review (Oral) (Books / Movies / Products..etc.,)

**Practice-6 :**Describing: Objects and Places

**Practice-7** : Describing: Events and Process

**Practice-8 :**Review (Oral) : Books / Movies / Products..etc.,

**Practice-9:** Video Speech Writing

**TASK – 5**

Reading Comprehension-Information Transfer.

**Practice-10 :**Reading practice for practice of Pronunciation – understanding;

**Practice-11 :**writing paragraph- graphs, flow charts, diagrams -Information Transfer

**TASK – 6**

Giving and Asking Directions - Poster Presentation

**Practice-12 :**Giving and Asking Directions

**Reference Books:**


1. A Textbook of English Phonetics for Indian Students 2nd Ed .Balasubramanian(Macmillian),2012
2. SkillfulLevel2Reading&WritingStudent'sBookPack(B1)MacmillanEducational.
3. English Pronunciation in Use. Intermediate & Advanced, Hancock, M. 2009.CUP
4. Rizvi,Ashraf.M.,EffectiveTechnicalCommunication,McGrawHill,NewDelhi.2005
5. Raman, Meenakshi&Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, New Delhi.2011.


**Software :**

1. Walden ELCS&AECS Lab
2. English In Mind (EIM) all level by Cambridge University
3. Cambridge Pronunciation Dictionary by Cambridge University
4. Oxford Advanced Learners Dictionary, Oxford University

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|---|---|---|---|---|---|---|---|---|
| 21ES1503 | ENGINEERINGGRAPHICS | | | | | | | R21 |
| Semester | Hours/Week | | | Tota lhrs | Credits | MaxMarks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| II | 0 | 1 | 4 | 80 | 3 | 40 | 60 | 100 |

**Pre-Requisite:** BasicMathematics(Geometry)

**CourseObjectives:**

1. Toimpartskillsonusingdrawinginstruments
2. Toconveyexactandcompleteinformationofanyphysicalobject.
3. ToConstructEngineering Curves.
4. ToLearnandpracticebasicAutoCAD commands.
5. ToInstruct theutilityofdrafting& modellingpackagesinorthographicandisometricdrawings

| **CourseOutcomes**: Attheendofthecourse,studentwillbeableto: | |
|---|---|
| **CO1** | Definethequalitiesofprecisionandaccuracyinengineeringdrawing.(BL-1) |
| **CO2** | Drawengineeringcurveswithdifferentmethods(BL-3). |
| **CO3** | Developtheorthographicprojectionofpointsandstraightlines(BL-3) |
| **CO4** | Constructtheplanesandsimplesolids.(BL-3). |
| **CO5** | UnderstandandpracticebasicAUTOCADcommands(BL-2) |

**COURSECONTENT**

**Part-AManualDrawing**

| **TASK–1** | **IntroductionandConicsections** | 10 Hours |
|---|---|---|

**IntroductiontoEngineeringgraphics**:PrinciplesofEngineeringGraphicsandtheirsignificance;various instruments used, drawing sheet sizes and title block, lettering, BIS conventions, types oflines and dimensioningmethods.

Geometricalconstructions:simpleconstructions,constructionofPentagon,Hexagonbygeneral Methodonly.

**ConicSections:**.Typesofconics:Ellipse,ParabolaandHyperbola(Eccentricitymethodonly),

| **TASK–-2** | **OrthographicProjections** | 10 Hours |
|---|---|---|

**ObjectivesandPrincipleofprojection,** Methodsofprojections,Comparison betweenfirstangleandthirdangleprojection.

**Projectionsofpoints:** Projectionofpointsplacedindifferentquadrants.

**Projection of straight lines: F**undamental concepts**,**Lineparallel,perpendicularandinclinedtooneandtworeferenceplanesplacedinfirstquadrantonly.

| **TASK–3** | **ProjectionsofSolids** | 15 Hours |
|---|---|---|

**Projectionsofplanes:**Projectionofplanes(Triangle,Square,Pentagon,Circle)parallel,Perpendiculara ndinclinedtooneandtworeferenceplanesplacedinfirstquadrantonly.

**Typesofsolids**;Polyhedra,Solidsofrevolution,

**Projections of regular solids** (Prisms, Pyramids,CylindersandCone),withitsaxisPer pendicular to one plane and parallel to other plane, Axisinclinedto one plane and paralleltootherplane.

| TASK–4 | IsometricandOrthographicviews | 10Hours |
|---|---|---|

**IsometricProjections:**Principles,Isometricscale,Isometricviews,Conventions, Isometricviewsoflines,planes,simplesolids(Cube,Cylinder,andCone), andConversion ofIsometricviewstoOrthographicviews.

**PartBComputerAidedDrafting**

| TASK–5 | IntroductiontoAutoCAD | 17 Hours |
|---|---|---|

Basicdrawingandediting commands:line,circle,rectangle,erase,view,undo,redo, snap, objectediting, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending,stretching,fillets,arrays,dimensions.Dimensioningprinciplesandconventionalrepresenta tions.

| TASK–6 | OrthographicandIsometricProjections | 18 Hours |
|---|---|---|

**Transformation of Isometric Projections into orthographic projections such as** simple solids such ascylinder,cone,squareprism,pentagonalpyramid

Draw3Dmodel ofmechanicalcomponentssuchasSteppedblock,Bushbearing,

| **Totalhours:** | **80hours** |
|---|---|

**TextBook(s):**


1. BhattN.D."ElementaryEngineeringDrawing",CharotarPublishers, 2014.
2. ShahandRana,EngineeringDrawing, 2/e, PearsonEducation,2009
3. K.L.Narayana&P.Kannaiah,EngineeringDrawing,3/e,ScitechPublishe rs,Chennai,2012.
4. EngineeringDrawingbyDrAVSSridharKumar, Dr.Krishnaiah,TPVaraPrasad. ,Spectrumeducation,SuntechnoPublications,2019


**ReferenceBook(s):**


1. EngineeringDrawingandGraphicTechnology-InternationalEdition,ThomasE.French,CharlesJ.Vierck,RobertJ.Foster, McGraw-Hill,2014
2. Venugopal.K"EngineeringDrawingandGraphics",NewAgeInternational(P)Ltd.,NewDelh i,2010

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21EN1001 | **ENGLISH**<br>**Common to all Branches (CSE,ECE,EEE,CE,ME)** | | | | | | | R21 |
| **Semester** | **Hours / Week** | | | **Total hrs** | **Credit** | **Max Marks** | | |
| | **L** | **T** | **P** | | **C** | **CIE** | **SEE** | **TOTAL** |
| II | 2 | 0 | 0 | 32 | 2 | 40 | 60 | 100 |

CO 1 :Acquire in depth knowledge on formulating appropriate sentences with grammatical accuracy and vocabulary building. (B.L:2)

CO 2 :Understand the factors that influence in use of grammar and effective strategies for professional written communication (B.L:2)

CO 3 :Explain the use of Grammar to improve effective writing Note making & Paraphrasing. (B.L:2)

CO 4 :Understand the Grammar to write dialogues and reviews effectively. (B.L:2)

CO 5 :Develop the skills and sub skills of reading and use strategies for reading effectively and provide knowledge on the structure and format of technical writing. (B.L:3)

**Module 1**

**Grammar :**Parts of Speech - Kinds of Sentences – Sentence structures: Identifying the sentences, Sentence Pattern, Sentence Improvement and Construction, Sentence Completion, Sentence Arrangement, Joining sentences, Para jumbles.

**Vocabulary :**Concept of word formation – Synonyms & Antonyms – Homonyms Homophones – Prefixes & suffixes – Commonly confused Words – One word substitutes – Idioms & Phrasal Verbs.

**Module 2**

**Grammar &Vocabulary :**Cohesive devices - linkers, sign posts and transition signals - Articles – Prepositions – Gerund - Verbs: Auxiliary verbs (Primary & Modal) – Tenses – Subject Verb agreement.

**Writing :**Principles of writing: clarity, simplicity, brevity, single focus, organization of thoughts - sequencing the ideas – Punctuation - Question formation (Wh- questions, Yes or No questions, Tag questions) - Letters (Formal & Informal) and Emails : Structure / template of common formal letters and emails: inquiry /complaint / placing an order.

**Module 3**

**Grammar :**Active and Passive Voice - Direct & Indirect Speech – Comparison of Adjectives – Cause and effect – Verb noun Collocations & Adjective - Noun Collocations.

**Writing :**Note Making – Summarizing - Paragraph Writing – Paraphrasing : Techniques of paraphrasing - Replacement of words and phrases, change of sentence structures.

**Module 4**

**Grammar :**Misplaced modifiers - If Clauses - Simple, Compound, Complex Sentences -Spotting Errors.

**Writing :**Dialogue writing ( Formal & Informal ) - compare and contrast paragraphs- Writing of Reviews: Book / Play / Movie.

**Module 5**

**Reading Skills :**Types of reading: Skimming, Scanning, Intensive & Extensive Reading – Reading Comprehension - Scramble Sentences - Complete the passage using contextual clues Identifying Main Ideas using Scanning - Technique Identifying Specific Ideas using Skimming Technique - Studying

the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
**Writing :**Describing – Report Writing: definition - purpose – types – structure - formal and informal reports - stages in developing report- proposal, progress and final reports –examples.

**Text Books:**


1. Contemporary English Grammar –Structures and Composition by David Green, MacMillan India, 2014.
2. Effective Technical Communication by Ashraf, M Rizvi,Tata McGraw-Hill, 2006.


**Reference Books:**


1. English Conversation Practice by Grant Taylor, Tata McGraw Hill,2009.
2. Practical English Usage by Michael Swan, OUP, 4th Edition.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press,2009.
4. English Vocabulary in Use Advanced by Michael McCarthy, Felicity O'Dell, Cambridge University Press,2008.
5. English for Technical Communication for Engineering Students, AyshaVishwamohan, Tata Mc Graw-Hill 2009.

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|---|---|---|---|---|---|---|---|---|
| 21EC2002 | NETWORK ANALYSIS | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 3 | 0 | 0 | 45 | 3 | 40 | 60 | 100 |

**Pre-requisite:** Fundamental of Basic Electrical circuits

**Course Objectives:**

1. To understand frequency response in electrical circuits
2. The capability to analyze the Low and High Pass filter.
3. Evaluate the behaviour of networks for transient analysis of first order and second order.
4. Analyze and synthesize networks using Laplace transforms.
5. Different types of two-port network analysis using network parameters, with different types of connections.

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | Describe the Series resonance ,parallel resonance and analyze the locus diagramsof R,L,C(BL-2) |
| **CO 2** | Analyze the DC transients of R,L,C (BL-4) |
| **CO 3** | Analyze the AC transients of R,L,C (BL-4) |
| **CO 4** | Derive Two port network parameters of Electrical circuits(BL-3) |
| **CO 5** | Analyze the Filters and Network functions(BL-4) |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| CO1 | 3 | 2 | 2 | 1 | | | | | | | | | 1 | 1 |
| CO2 | 3 | 2 | 2 | 2 | | | | | | | | | 1 | 1 |
| CO3 | 3 | 2 | 2 | 2 | | | | | | | | | 1 | 1 |
| CO4 | 3 | 3 | 2 | 2 | | | | | | | | | 1 | 1 |
| CO5 | 3 | 3 | 2 | 2 | | | | | | | | | 1 | 1 |

**COURSE CONTENT**

| MODULE – 1 | RESONANCE | 9hrs |
|---|---|---|

Introduction, Definition of quality factor **Q**of inductor and capacitor, Series resonance, Bandwidth of the series resonant circuits, Parallel resonance (or anti-resonance), Locus diagram for Series R-L, R-C, R-L-C and Parallel Combination with Variation of Parameters.

At the end of the Module 1, students will be able to:

1. Explain the series and parallel resonance.(BL-2)
2. Understand the effect of resonance on series and parallel resonance circuits.(BL-2)
3. Understand the concept of locus diagrams. (BL-2)

| MODULE -2 | DC TRANSIENT ANALYSIS | 9hrs |
|---|---|---|

Transient Response of R-L, R-C, R-L-C Series and Parallel Circuits for D.C Excitation-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms, Response of R-L & R-C Networks to Pulse Excitation.

At the end of the Module 3, students will be able to:

1. Explain the transient phenomenon in DC excitations. (BL-2)
2. Explain Application of Laplace transform for solution of D.C transient circuits. (BL-2)
3. Compare the classical method and Laplace transform approach in sinusoidal excitations. (BL-2)

| MODULE -3 | AC TRANSIENT ANALYSIS | 9hrs |
|---|---|---|

Transient Response of R-L, R-C, R-L-C Series and Parallel Circuits for Sinusoidal Excitations-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms.

At the end of the Module 4, students will be able to:

1. Explain the transient phenomenon in AC excitations. (BL-2)
2. Understand AC transient analysis in electrical circuits to know the power system stability. (BL-2)
3. Develop knowledge on R-L, R-C and R-L-C circuit analysis in A.C. (BL-3)

| MODULE -4 | TWO PORT NETWORKS | 9Hrs |
|---|---|---|

Two Port Network Parameters: Impedance, Admittance, Transmission and Hybrid Parameters and their Relations, Reciprocity and Symmetry conditions, Concept of Transformed Network, Two Port Network Parameters Using Transformed Variables.

At the end of the Module 5, students will be able to:

1. Understand the concept of two port network theory. (BL-2)
2. Verify the Reciprocity and Symmetry conditions for the given two port network. (BL-1)
3. Understand the conceptof Transformed Network(BL-2)

| MODULE-5 | FILTERS & NETWORK FUNCTIONS | 9HRS |
|---|---|---|

Filters – Low Pass – High Pass and Band Pass – RC, RL filters– derived filters and composite filters design – Attenuators – Network functions for one port and two port networks, pole-zeros of network functions and network stability

At the end of the Module 6, students will be able to:

1. Explain the types of filters. (BL-2)
2. Explain the parameters for the design of various filters. (BL-2)
3. Explain the poles and zeros of a given transfer function. (BL-2)

| Total hours: | 45 hours |
|---|---|

**Text Book(s):**

1. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", TMH, 5th Edition, New Delhi, 2015.
2. Ravish R., Network Analysis and Synthesis, 2/e, McGraw-Hill, 2015

**Reference Book(s):**

1. S.Sivanagaraju, G.Kishor & C.Srinivasa Rao, "Electrical Circuit Analysis", Cengage Learning, 1st Edition, 2010.
2. A. Chakrabarti : Circuit Theory (Analysis and Synthesis), Dhanpat Rai &Co
3. Joseph A. Edminister and Mahmood Nahvi, "Electric Circuits Schaum"s Outline Series", 6th Edition, Tata McGraw-Hill, 2014, New Delhi.

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|---|---|---|---|---|---|---|---|
| 21EC2003 | Signals and Systems | | | | | | R21 |
| **Semester** | **Hours / Week** | | | **Total hrs** | **Credit** | **Max Marks** | |
| | **L** | **T** | **P** | | **C** | **CIE** | **SEE** | **TOTAL** |
| **III** | **3** | **0** | **0** | **48** | **3** | **40** | **60** | **100** |

**Pre-requisite:**

- knowledge on Integration, Differentiations and Transforms

**Course Objectives:**

- To understand the mathematical description and representation of continuous and discrete-time signals and systems.
- To study the frequency representation of periodic signals.
- To characterize signals and systems using frequency domain methods.
- To study sampling theorem and to convert continuous-time signals to discrete-time signals with different techniques and vice-versa.
- To analyze continuous and discrete-time signals and systems using Laplace & Z- Transform mathematical tool.

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | Understand the mathematical description and representation of continuous and discrete-time signals and systems**.(BL-2)** |
| **CO 2** | Solve the problems based on the concepts of Fourier series and properties**.(BL-3)** |
| **CO 3** | Analyze the frequency spectra of various continuous and discrete-time signals using Fourier transform methods**. (BL-4)** |
| **CO 4** | Apply sampling theorem to convert continuous-time signals into discrete-time signals with different techniques and reconstruct back**. (BL-3)** |
| **CO 5** | Apply Laplace & Z-Transform as mathematical tool to continuous and discrete-time signals and systems**.(BL-3)** |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **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** |
| **CO1** | 2 | 1 | 1 | | 1 | | | | | | | 1 | 1 | |
| **CO2** | 2 | 2 | 2 | 1 | 1 | | | | | | | 1 | 2 | |
| **CO3** | 2 | 2 | 2 | 2 | 1 | | | | | | | 1 | 2 | |
| **CO4** | 2 | 2 | 2 | | | | | | | | | 1 | 1 | |
| **CO5** | 2 | 2 | 2 | 2 | 1 | | | | | | | 1 | 2 | |

1: Low, 2-Medium, 3- High

| COURSE CONTENT | | |
|---|---|---|
| **MODULE – 1** | **INTRODUCTION TO SIGNALS AND SYSTEMS** | **9 Hrs** |

**SIGNALS AND SYSTEMS:**Basic definitions and classification of Signals**,** Basic operations on signals, Classification of Continuous-Time and Discrete-Time Systems, Basic System Properties, Linear Time-Invariant Systems - Discrete-Time LTI Systems, Convolution Sum, Continuous-Time LTI Systems Convolution Integral, Properties of Linear Time-Invariant Systems.

At the end of the Module 1, students will be able to:

1. Understand classifications of the signals and systems. **(BL-2)**
2. Explain continuous and discrete time signals. **(BL-2)**
3. Understand the concept of convolution. **(BL-2)**

| **MODULE -2** | **FOURIER SERIES** | **8 Hrs** |
|---|---|---|

Representation of Fourier series, Continuous time periodic signals, Dirichlet's conditions, Properties of CT Fourier Series, Trigonometric Fourier Series and Exponential Fourier Series with examples, Complex Fourier spectrum, Fourier series representation of a periodic signals.

At the end of the Module 2, students will be able to:

1. Apply Fourier series for the periodic signals. **(BL-3)**
2. Solve problems by using Fourier series properties. **(BL-3)**
3. Sketch the complex Fourier spectrum. **(BL-3)**

| **MODULE-3** | **FOURIER TRANSFORMS** | **10 Hrs** |
|---|---|---|

Deriving Fourier Transform from Fourier series, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of CT Fourier Transform, Systems characterized by Linear constant coefficient differential equations. The Magnitude-Phase Representation of the Fourier Transform, The Magnitude-Phase Representation of the Frequency Response of LTI Systems**.** Definition, Computation and properties of DTFT for different types of signals and systems.

At the end of the Module 3, students will be able to:

1. Analyze the periodic and aperiodic signals by applying Fourier transforms.**(BL-4)**
2. Interpret the Magnitude-Phase Representation of F.T & LTI Systems. **(BL-2)**
3. Solve problems by using F.T properties. **(BL-3)**
4. Analyze the spectral characteristics of signals using Fourier transform. **(BL-4)**
5. Analyze of DTFT for different types of signals and systems. **(BL-4)**

| **MODULE-4** | **SAMPLING** | **7 Hrs** |
|---|---|---|

Representation of a Continuous Time Signal by its Samples - Sampling Theorem, Reconstruction of a Signal from its Samples Using Interpolation, types of sampling-natural sampling, flat- top sampling and impulse sampling, Effect of under sampling -Aliasing.

At the end of the Module 4, students will be able to:

1. Illustrate the representation of a Continuous Time Signal by sampling. **(BL-2)**
2. Understand the reconstruction of a sampled signal using Interpolation. **(BL-2)**
3. Compare different sampling techniques. **(BL-2)**
4. Solve problems for nyquist interval and nyquist rate. **(BL-3)**

| **MODULE-5** | **LAPLACE TRANSFORMS & Z-TRANSFORMS** | **14 Hrs** |
|---|---|---|

Definition, Region of Convergence, Properties, Inverse Laplace Transform, Relationship between Fourier and Laplace Transforms, Laplace Transform Pairs, Analysis and Characterization of LTI Systems Using the Laplace Transform .

Definition**,** Region of Convergence, Properties of the z-Transform, Inverse z-Transform, Relation between Fourier and Z Transforms, Common z- Transform Pairs, Analysis and Characterization of LTI Systems Using z-Transforms**.**

At the end of the Module 4, students will be able to:

1. Understand the properties of Laplace transform. **(BL-2)**
2. Analyze the continuous-time and discrete-time signals and systems using Laplace transform. **(BL-4)**
3. Interpret therelationship between Fourier and Laplace Transforms. **(BL-2)**
4. Find the stability of the systems using ROC. **(BL-1)**

| | |
|---|---|
| 5. Understand the properties of Z - transform. **(BL-02)**<br>6. Analyze the discrete-time signals and systems using Z - transforms. **(BL-04)**<br>7. Interpret therelationship between Fourier and Z - Transforms. **(BL-02)**<br>8. Find the stability of the systems using ROC. **(BL-01)** | |
| **Total hours:** | **48 Hours** |

**Text Book(s):**

1. A.V. Oppenheim, A.S.Willsky and S.H. Nawab, "Signals and Systems", 2ndEdition, PHI, 2009.
2. Simon Haykin and Van Veen, "Signals & Systems", 2ndEdition, Wiley, 2005.
3.Signals and Systems, J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, TMH

**Reference Book(s):**

1. Simon Haykin and B. Van Veen, Signals & Systems, John Wiley, 2nd Edition, 2010.
2. A. Anand Kumar, Signals & Systems, PHI, 2011.
3. B.P. Lathi, Principles of Linear Systems and Signals, Oxford University Press, 2nd Edition, 2013.

| NARAYANA ENGINEERING COLLEGE::GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21ES1009 | DATA STRUCTURES AND ALGORITHMS | | | | | | | R21 |
| SEMESTER | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

| COURSE CONTENT | | |
|---|---|---|
| **MODULE – 1** | **Introduction to Data Structures** | **9H** |
| **Introduction:** Overview of Data Structures, Implementation of Data Structures, Algorithm Specifications, Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off, Arrays. **Searching:** Introduction, Basic Terminology, Linear Search and Binary Search Techniques and their complexities. | | |
| **MODULE – 2** | **Stacks and Queues** | **9H** |
| **Stacks:** Introduction, Representation of a Stack, Stack Operations, Applications of Stacks. **Queues:** Introduction, Representation of a Queue, Queue Operations, Various Queue Structures: Circular Queue, Double Ended Queue, Priority Queue, Applications of Queues. | | |
| **MODULE – 3** | **Linked Lists and Sorting** | **10H** |
| Introduction, Singly linked lists, Doubly Linked Lists, Circular Linked Lists, Linked Stacks and Queues, Applications of Linked Lists. **Sorting:** Introduction, Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort | | |
| **MODULE – 4** | **Trees** | **10H** |
| Introduction, Basic Terminologies, Definition and concepts, Representation of Binary Tree, operations on a Binary Tree, Binary Search Tree, Height balanced Binary Tree, B Trees. | | |
| **MODULE – 5** | **Graphs & Hashing** | **10H** |
| Graphs: Introduction, Graph Terminologies, Representation of Graphs, Graph Operations, Shortest Paths, Topological Sorting, Minimum Spanning Trees – Kruskal's and Prim's algorithms. Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing. | | |
| | **Total hours:** | **48 hours** |

**TEXTBOOK:**


1. D. Samanta, **Classic Data Structures**, 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Ellis Horowitz and Sartaj Sahni, **Fundamentals of Data Structures in C**, 2nd Edition, Universities Press, 2008.


**REFERENCES:**


1. Data Structures A Pseudo code Approach with C, Second Edition by Richard F. Gilberg, Behrouz A. Forouzan, Cengage Learning.
2. Data Structures and Algorithms Using C++ by Ananda Rao Akepogu, Radhika Raju Palagiri, Pearson, 2010.

3. Data Structures and Algorithms Made Easy by Narasimha Karumanchi, Careermonk Publications, 2016
4. Peter Bras, “Advanced Data Structures”, Cambridge University Press, 2014
5. Data Structures, RS Salaria, Khanna Publishing House, 3rd Edition, 2017
6. Data Structures through C, Yashwant Kanetkar, BPB Publications, 3rd Edition, 2019
7. Expert Data Structures with C, RB Patel, Khanna Publications, 2019

| NARAYANA ENGINEERING COLLEGE::GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21ES1513 | DATA STRUCTURES AND ALGORITHMS LAB | | | | | | | R21 |
| SEMESTER | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| **III** | 0 | 0 | 3 | 48 | 1.5 | 40 | 60 | 100 |

| COURSE CONTENT | | |
|---|---|---|
| **TASK-1** | | **3H** |
| 1. Write a Program to Implement the following Searching Algorithms:<br>a)Linear Search b) Binary Search | | |
| **TASK– 2** | | **6H** |
| 1. Implement the following using arrays:<br>A. Write a Program to Implement Stack Operations<br>B. Write a Program to convert a given infix expression into its Postfix using stack.<br>2.Write a Program to evaluate the Postfix Expression using stack | | |
| **TASK-3** | | **3H** |
| 1. Write a Program to Implement Queue Operations using Arrays<br>2.Write a Program to Implement Circular Queue Operations using Arrays | | |
| **TASK-4** | | **6H** |
| 1. Write a Program to implement the operations of Singly Linked List<br>2.Write a Program to implement the operations of Doubly Linked List | | |
| **TASK-5** | | **6H** |
| 1. Write a Program to implement stack operations using linked list<br>2.Write a Program to implement the operations of Circular Singly Linked List | | |
| **TASK-6** | | **3H** |
| 1.Write a Program to Sort the set of elements:<br>a) Insertion Sort b) Quick Sort | | |
| **TASK-7** | | **3H** |
| 1. Write a Program to Sort the set of elements:<br>a)Merge Sort b) Heap Sort | | |
| **TASK-8** | | **6H** |
| 1. Write a Program to implement the following on trees<br>a) Insertion and deletion operations<br>b) Traversals | | |

| | | |
|---|---|---|
| 2.Write a Program to implement Binary Search Tree Operations. | | |
| **TASK-9** | | **6H** |
| 1. Write a Program to implement the following Graph Traversal Algorithms:<br>a) Depth first traversal b) Breadth first traversal | | |
| **TASK-10** | | **6H** |
| 1. Write a Program to implement the following Minimum Spanning Tree Algorithms:<br>a) Kruskal's Algorithm b) Prim's Algorithm | | |
| **Additional Experiments:** | | |
| 1. Write Program to Implement Fibonacci Search<br>2. Write a Program to Implement Double Ended Queue Operations by using Array<br>3.Write a Program to Implement Tree traversal Techniques<br>4.Write a Program to Implement Radix Sort | | |
| | | **48 hours** |

**TEXTBOOK:**


1. D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Horowitz Sahni and Anderson-Freed —Fundamentals of Data Structures in C. 2nd Edition, Universities Press, 2008.


**REFERENCES:**


1. Richard F. Gilberg& B. A. Forouzan —Data Structures A Pseudocode Approcah with C, Second Edition, CENGAGE Learning.
2. Ananda Rao,Data Structures and Algorithms Using C++,Akepogu, Radhika Raju Palagiri, Pearson, 2010.
3. Mark Allen Weiss, Data structure and Algorithm Analysis in C. Addison Wesley Publication. 2006.

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21EC2001 | DIGITAL LOGIC DESIGN | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 2 | 0 | 0 | 48 | 2 | 40 | 60 | 100 |

**Pre-requisite:** Basic knowledge on number system and algebra.

**Course Objectives:**

1. To study the basic concepts of number systems and binary codes.
2. To minimize Boolean expressions using map and Q-M method.
3. To design combinational and sequential circuits.
4. To familiarize Registers &counters using Flip-Flops.
5. To understand the concept of memory organization

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | **Use** number systems, binary codes and Boolean algebra to implement digital circuits **(BL-3)** |
| **CO 2** | **Apply** minimization techniques on Boolean expressions. **(BL-3)** |
| **CO 3** | **Design** combinational circuits using logic gates. **(BL-3)** |
| **CO 4** | **Analyze** synchronous sequential circuits. **(BL-4)** |
| **CO 5** | **Classify**the memories and programmable logic devices. **(BL-2)** |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| CO1 | 2 | 2 | 1 | 1 | | | | | | | | | 1 | |
| CO2 | 1 | 2 | 1 | | | | | | | | | | 1 | |
| CO3 | 2 | 2 | 2 | 1 | 1 | | | | | | | 1 | 1 | 1 |
| CO4 | 1 | 2 | 2 | 1 | 1 | | | | | | | 1 | 2 | 1 |
| CO5 | 1 | | 1 | | | | | | | | | 2 | 1 | 1 |

1: Low, 2-Medium, 3- High

**COURSE CONTENT**

| MODULE – 1 | NUMBER SYSTEMS & BOOLEAN ALGEBRA | 10 h |
|---|---|---|

Number Systems: Introduction, Number Systems, Number base conversions, 1's and 2's Complements, BCD code, Excess -3 codes, Gray code, ASCII code, Error Detection and Correction Codes. Boolean Algebra: Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, Logic gates, implementation of Boolean functions using logic gates

At the end of the Module 1, students will be able to:

1. List number systems. (BL-1)
2. Illustrate different code conversions. (BL-2)
3. List Theorem's and properties of Boolean algebra (BL-1)
4. Explain the functionality of logic gates(BL-2)

| MODULE -2 | SIMPLIFICATION OF BOOLEAN FUNCTIONS | 10 h |
|---|---|---|

Introduction, Karnaugh map simplification, Don't care conditions, Prime Implicants, Quine-McCluskey method Simplification, NAND & NOR Implementations, Two Level Implementations.

At the end of the Module 2, students will be able to:

1. Apply basic laws and De Morgan's theorems to simplify Boolean expressions(BL-3)
2. Explain map and Q-M method to minimize Boolean expressions. (BL-2)
3. Implement Boolean expression using universal gates. (BL-3)
4. Implement Boolean expression using two level methods. (BL-3)

| MODULE-3 | COMBINATIONAL CIRCUITS | 9 h |
|---|---|---|

| | | |
|---|---|---|
| Introduction, Design Procedure, Adders, Sub tractor, Binary Adder-Sub tractor, BCD Adder, Binary Multiplier, Magnitude Comparator, Multiplexers, De-multiplexers, Decoders, Encoders and Code Converters. | | |
| At the end of the Module 3, students will be able to:<br>1. Design combinational logic circuits. (BL-3)<br>2. Implement Boolean expression using multiplexer. (BL-3)<br>3. Implement higher order MUX using lower order MUX.(BL-3)<br>4. Design code converters using gates. (BL-3) | | |
| **MODULE-4** | **SEQUENTIAL CIRCUITS** | **10 h** |
| Introduction, Latches, Flip-flops, Master-slave flip flops, Edge-triggered flip-flops, Flip-Flop conversions, Design of Synchronous Sequential Circuits: State Equations, State Table, State reduction, State assignment, State diagram , Mealy and Moore machine models, Registers, Shift Registers, Counters: Synchronous counters, Asynchronous counters & other counters. | | |
| At the end of the Module 4, students will be able to:<br>1. Describe behavior of latches & flip flops. (BL-2)<br>2. Analyze the flip-flop conversions(BL-3)<br>3. Analyze synchronous sequential circuits. (BL-3)<br>4. Explain the design procedure of sequential circuits(BL-2)<br>5. Design synchronous sequential circuits using state reduction & assignment process. (BL-3) | | |
| **MODULE-5** | **MEMORY &PROGRAMMABLE LOGIC DEVICES** | **9 h** |
| Introduction, Random Access Memory, Types of RAM, Memory decoding, Read Only Memory, Types of ROM, Flash memory, Programmable Logic Devices (PLDs): Basic concepts, Programmable Read Only Memory (PROM), Programmable Array Logic (PAL) and Programmable Logic Array(PLA). | | |
| At the end of the Module 6, students will be able to:<br>1. Explain PROM, PAL and PLA. (BL-2)<br>2. Compare digital logic families. (BL-2)<br>3. Illustrate the characteristics of digital IC's . (BL-2) | | |
| | **Total hours:** | **48 hours** |

**Text Book(s):**


1. M. Morris Mano, M.D. Ciletti, "Digital Design", 5th edition, Pearson, 2018.
2. John F Wakely Digital Design Principles And Practices, Pearson Publication , Fourth edition
3. Anil K. Maini, "Digital Electronics: Principles, Devices and Applications", Willey, 2007


**Reference Book(s):**


1. Anand Kumar, Switching Theory and Logic Design, PHI,2008
2. John. M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3. R. P. Jain, "Modern Digital Electronics", 4th edition, McGraw Hill Education (India Private Limited), 2012.

| NARAYANA ENGINEERING COLLEGE: GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21MA1005 | COMPLEX ANALYSIS& NUMERICAL METHODS | | | | | | | R-21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

**Pre-requisite**: inter mathematics

**Course Objectives:** This course aims to providing the knowledge for the student about on

1. Special functions and
2. Complex Variables Differentiation & Integration.
3. Various numerical methods for solving an algebraic and transcendental equations,
4. To interpolating the values through the polynomials,
5. To evaluation of integral values through the numerical methods
6. To solve ordinary differential equations through the numerical methods.

**Course Outcomes**: After successful completion of the course, the student will able to:

| | |
|---|---|
| **CO 1** | Apply the techniques of special functions in various engineering problems (L-3) |
| **CO 2** | Evaluate derivatives of complex functions. (L-5) |
| **CO 3** | Evaluate improper integrals of complex functions using Residue theorem. (L-5) |
| **CO 4** | solve algebraic and transcendental equations and interpolate the trend value (L-3) |
| **CO5** | ToSolve ordinary differential equations by using numerical methods (L-3) |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | 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 |
| CO1 | 3 | 3 | | | | | | | | | | | | |
| CO2 | 3 | 3 | 2 | | | | | | | | | | | |
| CO3 | 3 | 3 | | | | | | | | | | | | |
| CO4 | 3 | 3 | 2 | | | | | | | | | | | |
| CO5 | 3 | 3 | | | | | | | | | | | | |

1- Low, 2-Medium, 3- High

**COURSE CONTENT**

| MODULE – 1 | Special Functions | Hours:10 |
|---|---|---|

Introduction to special functions, Beta function- Definition of beta function and its properties (with proof), Other forms of Beta function (with proof), Gamma function- Definition of Gamma function and its properties (with proof), Relation between Beta and Gamma functions (with proof)

At the end of the Module 1, students will be able to:

1. Understand Beta and Gamma functions and its relations.(L-3)
2. Explain the applications and the usefulness of these special functions. (L-2)
3. Use Beta & Gamma functions to evaluate different types of integral problems (L-1)
4. Apply the techniques of special functions in various engineering problems. (L-3)

| MODULE -2 | Complex variables – Differentiation | Hours:10 |
|---|---|---|

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate-construction of analytic function by Milne -Thomson method.

At the end of the Module 2, students will be able to:

1. Understand functions of Complex variable and its properties. (L-3)
2. Evaluate derivatives of complex functions. (L-5)
3. Understand the analyticity of complex functions. (L-3)

| MODULE-3 | Complex Variables – Integration | Hours:8 |
|---|---|---|

Line integral-Contour integration, Cauchy's integral theorem (without proof), Cauchy's Integral formula (without proof), zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi-circle with

At the end of the Module 3, students will be able to:

1. Understand the integration of complex functions. (L-3)
2. Apply Cauchy's integral theorem and Cauchy's integral formula. (L-3)
3. Understand singularities of complex functions. (L-3)
4. Evaluate improper integrals of complex functions using Residue theorem. (L-5)

| MODULE-4 | Solution of Algebraic, Transcendental Equations & Interpolation | Hours:10 |
|---|---|---|

Introduction-Bisection method, Regula-falsi method, Newton Raphson method,Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae.

At the end of the Module 4, students will be able to:

1. Solve an algebraic or transcendental equation using an appropriate numerical method. (L-3)
2. Understand the use of different operators in interpolation. (L-2)
3. Find interpolating polynomials using Newton's forward and backward formulae. (L-2)
4. Understand the theoretical and practical aspects of the use of numerical methods. (L-2)

| MODULE-5 | Numerical integration & Solution of ordinary differential equations | Hours:10 |
|---|---|---|

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method- Runge-KuttaMethod.

At the end of the Module 5, students will be able to:

1. Apply numerical differentiation and integration techniques to various engineering problems.(L-3)
2. Understand the techniques of Trapezoidal rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule and its applications (L-2)
3. Work out numerical differentiation whenever and wherever routine methods are not (L-1)
4. Apply Runge-kutta method in engineering problems (L-3)

| | |
|---|---|
| **Total hours** | **48** |

**Text Book(s):**


1. B.S. Grewal, "Higher Engineering Mathematics", 44th edition ,Khanna Publishers,2017.
2. 2 Ramana B.V., "Higher Engineering Mathematics", McGraw Hill Publishers,2017..
3. 3. S.S. SASTRY, Introductory Methods of Numerical Analysis, 5/e, PHI learning private limited, 2012.

**Reference Book(s):**


1. Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley.
2. Veerarajan T., “Engineering Mathematics”, Tata McGraw-Hill.
3. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ELECTRONIC DEVICES AND CIRCUIT | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 2 | 0 | 0 | 48 | 2 | 40 | 60 | 100 |

| COURSE CONTENT | | |
|---|---|---|
| **MODULE – 1** | **SEMICONDUCTOR DIODE&SPECIAL SEMICONDUCTOR DEVICES** | **10 Hrs** |

**Semiconductor Diode:** Principle and Structure of PN junction diode, Open circuited PN junction diode, Energy band diagram of PN diode, Diode current Equation, Volt-Ampere Characteristics, Temperature dependence of Volt-Ampere Characteristics, Diode capacitance.

**Special Semiconductor Devices:** Principle of operation and Characteristics of Varactor diode, Tunnel Diode, Photo diode, LED, SCR

At the end of the Module 1, student will be able to:

1.Define PN junction diode (BL-1)
2. Explain the operation of PN junction diode for both forward and reverse bias. (BL-2)
3.Explain the energy band diagram of PN junction diode (BL-2)
4. Interpret the effect of temperature on V-I characteristics of PN junction diode (BL-2)
5. Derive the expression for transition and diffusion capacitance (BL-2)
6. Explain V-I Characteristics of various special diodes. (BL-2)
7. Describe the principle of operation of thyristors. (BL-2)

| MODULE -2 | RECTIFIERS & FILTERS | 10 Hrs |
|---|---|---|

**Diode applications:** P-N junction diode as a rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, rectifier parameters, Harmonic components in Rectifier Circuits. Clippers and Clampers (Qualitative Treatment only)

**Filters**: Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters, bleeder resistor.

At the end of the Module 2, students will be able to:

1. Explain the operation of a bridge rectifier. (BL-2)
2. Analyze the performance of rectifiers with and without filters. (BL-4)
3. Design half wave and full wave rectifier circuits. (BL-4)
4. Differentiate various rectifier circuits in terms of their parameter metrics.(BL-2)
5. Explain the importance of bleeder resistor (BL-2)

| MODULE-3 | BIPOLAR JUNCTION TRANSISTOR | 9 Hrs |
|---|---|---|

**Bipolar junction Transistor :**Construction, Principle of Operation, transistor current components , transistor configurations, Transistor h-parameter model, calculation of h-parameters from characteristics, transistor as a switch, transistor as an amplifier.

At the end of the Module 3, students will be able to:

1. Discuss the current components and their relationships in BJT (BL-2)
2. Explain principle, operation and applications of BJT (BL-2)
3. Describe input and output Characteristics of BJT (BL-2)
4. Differentiate BJT configurations (CB,CC,CE) (BL-2)

| MODULE-4 | TRANSISTOR BIASING | 10 Hrs |
|---|---|---|

**Transistor Biasing:** Need for biasing, operating point, load line analysis, Stabilization against variations in $I_{CO}$, $V_{BE}$ and β, biasing and stabilization techniques: fixed bias, collector to base bias, voltage divider bias, bias compensation techniques, thermal runaway, heat sink and thermal stability.

At the end of the Module 4, students will be able to:

1. Explain principle, operation and applications of MOSFET (BL-2)
2. Describe the operation and characteristics of Depletion MOSFET. (BL-2)
3. Explain the operation and characteristics of Enhancement MOSFET. (BL-2)
4. Differentiate enhancement and depletion mode MOSFET. (BL-2)

| MODULE-5 | METAL OXIDE SEMICONDUCTOR FIELD-EFFECT TRANSISTOR | 9 Hrs |
|---|---|---|

**MOSFET:** Construction of depletion mode and enhancement mode of NMOS and PMOS, Drain characteristics of MOSFET, Transfer Characteristics of MOSFET, MOSFET as aSwitch, CMOS Inverter and it's Characteristics.

At the end of the Module 5, students will be able to:

1.Define biasing and stabilization (BL-1)
2.Explain the importance of thermal stability (BL-2)
3.Analyze the stabilization techniques.(BL-4)
4. Differentiate compensation techniques. (BL-2)

| Total hours: | 48 Hours |
|---|---|

**Text Book(s):**


1. 1. J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.
2. L. Boylestad and Louis Nashelsky (2006), Electronic Devices and Circuits, 9th Edition, Pearson/Prentice Hall
3. Electronic Devices and Circuits by Lal Kishore, BS Publications.


**Reference Book(s):**


1. Behzad Razavi, "Microelectronics", Second edition, Wiley, 2013.
2. S. Salivahanan, N. Suresh Kumar, A. Vallavaraj (2008), Electronic Devices and Circuits, 2nd edition, Tata McGraw Hill, New Delhi.
3. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **21ES1514** | **ELECTRONIC DEVICES AND CIRCUITS LAB** | | | | | | | R2020 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| III | 0 | 0 | 2 | 36 | 1 | 40 | 60 | 100 |
| **Pre-requisite:Basic knowledge on semiconductor physics.** | | | | | | | | |
| **Course Objectives:**<br>1. To Gain Knowledge on basic electronic devices.<br>2. To Observe the characteristics of various electronic devices.<br>3. To prepare students for designing various biasing circuits | | | | | | | | |
| **Course Outcomes**: After successful completion of the course, the student will be able to: | | | | | | | | |
| **CO 1** | Demonstrate the basic characteristics and applications of basic electronic devices. **(BL-02)** | | | | | | | |
| **CO 2** | Draw the characteristics of electronic devices by plotting graphs**(BL-02)** | | | | | | | |
| **CO 3** | Analyze the Characteristics of UJT, BJT, FET, and SCR **(BL-04).** | | | | | | | |
| **CO 4** | Design FET based amplifier circuits/BJT based amplifiers for the given specifications.**(BL-03)** | | | | | | | |

| CO-PO Mapping | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO** | **PO** | | | | | | | | | | | **PSO** | |
| | **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** |
| **CO1** | 2 | | | | | | | | | | | | | |
| **CO2** | 2 | | | | | | | | | | | | | |
| **CO3** | 2 | 2 | | 1 | | | | | | | | | 1 | |
| **CO4** | 2 | 2 | 2 | | | | | | | | | | 1 | |
| 1: Low, 2-Medium, 3- High | | | | | | | | | | | | | | |

| COURSE CONTENT | CO |
|---|---|
| **Task-1: PN Junction Diode** | |
| **Objective:** To Verify the Volt- Ampere characteristics of a PN junction diode and find static, dynamic and reverse resistances of the diode from the graphs. | CO1 |
| **Task-2: ZENER DIODE** | |
| **Objective: To** design a Zener diode basedvoltage regulatoragainst variations of supply and load. | CO 2 |
| **Task-3: Half Wave Rectifier** | |
| **Objective:** To design a half wave rectifier for the given specifications with and without filters and verify experimentally and draw suitable graphs. | CO 3 |
| **Task-4: FULL WAVE RECTIFIER** | |
| **Objective:** To design a full wave rectifier for the given specifications with and without filters, and verify the given specifications experimentally. Vary the load and find ripple factor. And draw suitable graphs. | CO 3 |
| **Task-5:COMMON EMITTER CONFIGURATION** | |
| **Objective:** To Verify the input and output characteristics of BJT in Common Emitterconfiguration experimentally and find the required h – parametersfrom the graphs | CO 3 |
| **Task-6:Common Emitter Configuration** | |
| **Objective:** To Verify the input and output characteristics of BJT Common Emitter configuration experimentally and find h – parameters from the graph | CO3 |

| | |
|---|---|
| **Task-7: Common Collector configuration** | |
| **Objective:** To Verify the input and output characteristics of BJT Common Collector configuration experimentally and find h – parameters from the graph | CO3 |
| **Task-8: MOSFET Characteristics** | |
| **Objective:** To Study and draw the Volt Ampere characteristics of MOSFET | CO 4 |
| **Task-9: MOSFET As Switch** | |
| **Objective:**To Study the Switching characteristics. | CO 4 |
| **Task-10:LED Characteristics** | CO4 |
| **Objective:** To Study the characteristics of LED | |

| | |
|---|---|
| **Additional Experiments** | |
| **Task-11: VOLTAGE- DIVIDER BIAS CIRCUIT USING BJT.** | |
| **Objective:** To Design and analyse the voltage- divider bias/self bias circuit using BJT | CO 1 |
| **Task-12:CLIPPERS AND CLAMPER CIRCUITS** | |
| **Objective:** To Verify clipping and clamper circuits using PN junction diode and draw the suitable graphs | CO 1 |

**Text Book(s):**

1. Fundamentals of Electronic Devices and Circuits Lab Manual By David Bell
2. Electronics Lab Manual ByNavas K. A
3. Fundamentals of Electronic Circuit Design, Getting Started: MultiSim Textbook Edition byDavid J. Comer, Donald T. Comer.

**Reference Book(s):**

1. A Guide to Circuit Simulation and Analysis Using PSPICE by Paul W. Tuinenga
2. Ben G. Streetman, Sanjay Banerjee , Solid State Electronic Devices, Pearson Prentice Hall, 2006.
3. Robert T. Paynter, “Introductory Electronic Devices and Circuits”, Pearson Education, 7th Edition
4. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, Oxford University Press, 5th Edition.

| NARAYANA ENGINEERING COLLEGE: GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21EC2007 | PROBABILITY AND STOCHASTIC PROCESSES | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| IV | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

**Pre-requisite:**

- Set theory
- Integrations, differentiations, partial differentiations formulas
- Terms involved in Electronics & Communications

**Course Objectives:**

1. To understand the basic probability concepts and to find the probability.
2. To acquire skills in handling situations involving more than one random variable and functions of random variables.
3. To analyze the concept of statistical averages.
4. To understand types of random processes, Auto-correlation, Cross Correlation and power spectral density and cross power spectral density
5. To understand the principles of random process relate to system concepts

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | Apply the concepts on appropriate sample space to find probabilities (**BL-3)** |
| **CO 2** | Calculate statistical averages from probability density functions (pdfs) and probability distribution functions **(BL-3)** |
| **CO 3** | Apply the different operations to multiple random variables **(BL-3)** |
| **CO 4** | Analyze power spectral density and cross power density spectrum of a random process. **(BL-4)** |
| **CO 5** | Analyze the response of a system using principles of random process. **(BL-4)** |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **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** | **PSO 2** |
| **CO1** | 2 | | | 2 | 1 | | | | | | | 2 | 1 | |
| **CO2** | 2 | 2 | | 1 | 1 | | | | | | | 2 | 1 | |
| **CO3** | 2 | 2 | | 1 | 1 | | | | | | | 2 | 1 | |
| **CO4** | 2 | 2 | | 2 | 2 | | | | | | | 2 | 1 | |
| **CO5** | 2 | 2 | | 2 | 2 | | | | | | | 2 | 1 | |

1: Low, 2-Medium, 3- High

**COURSE CONTENT**

| **MODULE – 1** | **PROBABILITY** | **9 Hrs** |
|---|---|---|

Probability introduced through Sets and Relative Frequency; Probability space& Axioms; Mathematical Model of Experiments**,** Joint probability, Conditional probability, Total probability and Baye's theorem

At the end of the Module 1, students will be able to:

1. Understand the fundamental concepts of probability (BL-2)
2. Find the probability for real time examples (BL-1)
3. Find total probability (BL-1)
4. Apply Baye's theorem for different real time applications (BL-3)

| MODULE -2 | DISCRETE& CONTINUOUS RANDOM VARIABLES | 9 Hrs |
|---|---|---|

Probability mass function, probability distribution function, example random variables and distributions and density functions; Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random Variables; Central limit theorem (without+ proof)

At the end of the Module 2, students will be able to:

1. Understand probability distribution and density functions (BL-2)
2. Outline the importance of the central limit theorem (BL-2)
3. Solve the moments to the sum of random variables (BL-3)
4. Apply different probability distribution and density functions on random variables.(BL-3)

| MODULE-3 | OPERATIONS ON MULTIPLE RANDOM VARIABLES | 9 Hrs |
|---|---|---|

Expected value of a function of random variables, joint moments about the origin, joint central momentsTransformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables. Markov, Chebyshev and Chernoff bounds.

At the end of the Module 3, students will be able to:

1. Understand the moments for multiple random variables. (BL-2)
2. Understand the concepts of linear transformation of Gaussian random variables. (BL-2)
3. Apply the different operations to multiple random variables. (BL-3)

| MODULE-4 | RANDOM PROCESSES: TEMPORAL CHARACTERISTICS& SPECTRAL CHARACTERISTICS | 12 Hrs |
|---|---|---|

The random process concept, classification of processes, concept of stationary and statistical independence. Correlation function.

Power spectrum Properties, Relationship between power spectrum and autocorrelation function, properties of power spectral density, relation between cross – power density spectrum and cross correlation, properties of cross power spectral density; problems.

At the end of the Module 4, students will be able to:

1. Define continuous and discrete-time random processes. (BL-1)
2. Explain various Stationary Processes. (BL-2)
3. Apply the concepts and its properties of auto correlation. (BL-3)
4. Apply the concepts and its properties cross correlation functions. (BL-3)
5. Understand the concepts of power spectral density&cross power spectral density (BL-2)
6. Apply PSD&CPSD properties on random process. (BL-3)
7. Apply CPSD properties on random process. (BL-3)

| MODULE-5 | RANDOM SIGNAL RESPONSE OF LINEAR SYSTEMS | 9Hrs |
|---|---|---|

System Response – Convolution, Mean and Mean squared Value of System Response, autocorrelation Function of Response, Cross Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band Limited and Narrowband Processes, Properties.

**Noise Definitions:** White Noise, Ideal low passfiltered white noise, RC filtered white noise.

| | |
|---|---|
| At the end of the Module 6, students will be able to:<br>1. Relate the theory of stochastic processes to analyze linear systems. (BL-2)<br>2. Understand the concepts of low pass and band pass noise models for random processes. (BL-2)<br>3. Apply the statistical characteristics to response of linear systems. (BL-3)<br>4. Analyse the output characteristics of a system when input is an WSS process. (BL-4) | |
| **Total hours:** | **48 Hours** |

**Text Book(s):**


1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", TMH, 4th edition, 2001.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", PHI, 4th edition, 2002.


**Reference Book(s):**


1. Henry Stark and John W. Woods, "Probability and Random Processes with Application to Signal Processing", Pearson Education, 3rd edition.
2. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis", Oxford, 3rd edition, 1999.
3. Keiser, Gerd, "probability theory and stochastic processes", TMH publications, 4th edition.

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21EC2006 | ELECTRONIC CIRCUIT ANALYSIS AND DESIGN | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| IV | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

**Pre-requisite:** Basic knowledge on concepts of electronic devices.

**Course Objectives:**

1. To study the effect of negative feedback on amplifier characteristics.
2. To design RC & LC oscillator circuits.
3. To analyze amplifier frequency response at low and high frequencies.
4. To study coupling schemes and multi stage amplifiers.
5. To analyze the large signal amplifiers and tuned amplifiers.

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | Analyze small signal amplifiers at low frequencies and high frequencies.(BL-4) |
| **CO 2** | Understand the concept of different negative feedback amplifiers. (BL-2) |
| **CO 3** | Understand the working principle of RC & LC oscillators. (BL-2) |
| **CO 4** | Analyze various configurations of multistage amplifiers. (BL-4) |
| **CO 5** | Learn operation of Power amplifiers and Tuned amplifiers.(BL-2) |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| CO1 | 2 | 2 | 1 | | 1 | | | | | | | 1 | 2 | |
| CO2 | 2 | 2 | 1 | | 1 | | | | | | | 1 | 2 | |
| CO3 | 2 | 2 | 2 | 1 | 1 | | | | | | | 1 | 2 | |
| CO4 | 2 | 2 | 2 | 1 | 1 | | | | | | | 1 | 2 | |
| CO5 | 2 | 2 | 2 | | 1 | | | | | | | 1 | 2 | |

1: Low, 2-Medium, 3- High

**COURSE CONTENT**

| MODULE – 1 | SMALL SIGNAL LOW FREQUENCY& HIGH FREQUENCYANALYSIS | 10 Hrs |
|---|---|---|

**Low Frequency Analysis:**

Transistor hybrid model, determination of h-parameters, conversion of h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis.

**High Frequency Analysis:**

Hybrid- π Common Emitter transistor model, Hybrid πconductance's, Hybrid π capacitances, Validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain,Current gain with resistive load.

At the end of the Module 1, students will be able to:

1. Define Transistor hybrid model.(BL-1)
2. Compare different transistor amplifiers. (BL-2)
3. Explain the effect of coupling and emitter bypass capacitors. (BL-2)
4. Explain the gain bandwidth product of amplifiers.(BL-2)
5. Analyze the Emitter follower frequency response at high frequencies.(BL-4)
6. Analyze the hybrid π CE transistor model. (BL-4)

| MODULE -2 | FEEDBACK AMPLIFIERS | 10 Hrs |
|---|---|---|
| Feedback concept, types of feedback, classification, feedback topologies, Characteristics of negative feedback amplifiers,Generalized analysis of feedback amplifiers, Determination of input & output impedance of different feedback amplifier, Method of Analysis of Feedback Amplifiers. | | |
| At the end of the Module 2, students will be able to:<br>1. Define negative and positive feedback in amplifiers.(BL-1)<br>2. Explain the effect of negative feedback on amplifier characteristics.(BL-2)<br>3. Compare different feedback topologies. (BL-2) | | |
| **MODULE-3** | **OSCILLATORS** | **9 Hrs** |
| Oscillator principle, condition for oscillations, types of oscillators, Generalized analysis of LC Oscillators, Hartley oscillator &Colpitt's oscillator using BJT and FET with relevant analysis, Crystal oscillators, RC-phase shift oscillator & Wein bridge oscillator using BJT with relevant analysis, Frequency& amplitude stability of oscillators. | | |
| At the end of the Module 3, students will be able to:<br>1. Explain condition for oscillations and types of oscillators.(BL-2)<br>2. Illustrate the operation of RC oscillators.(BL-2)<br>3. Explain the operation of LC oscillators.(BL-2)<br>4. Demonstrate the frequency and amplitude stability of oscillators(BL-2) | | |
| **MODULE-4** | **MULTISTAGE AMPLIFIERS** | **10 Hrs** |
| Classification of amplifiers, Methods of coupling, Generalized analysis of Cascaded amplifier, Analysis of two stage RC coupled amplifier with frequency response, Cascode amplifier, Emitter follower , Darlington pair amplifier, Differential amplifier using BJT. | | |
| At the end of the Module 4, students will be able to:<br>1. Explain the concept of cascading and coupling schemes(BL-2)<br>2. Analyze two stage RC coupled amplifier (BL-4)<br>3. Summarize the darlington amplifier parameters.(BL-2)<br>1. Explain differential amplifier with BJT. (BL-2) | | |
| **MODULE-5** | **POWER AMPLIFIERS &TUNED AMPLIFIERS** | **9 Hrs** |
| Power Amplifiers: Classification, Class A Power Amplifier, Distortion, Second harmonic Distortion, Class B Amplifier, Push- pull amplifier, Complementary Symmetry Class AB Amplifier, Class C Amplifier, Thermal stability and Heat sink.<br><br>Tuned Amplifiers: Tuned Circuit, Q-Factor, Single tuned capacitive coupled amplifier, Effect of Cascading Single tuned amplifiers on Band width, Stability. | | |
| At the end of the Module 5, students will be able to:<br>1. List types of power amplifiers &compare the voltage and power amplifier.(BL-2)<br>2. Discuss heat sinks, thermal stability and distortions.(BL-1)<br>3. Explain the concept of tuned circuits. (BL-02)<br>4. Compare different tuned amplifiers. (BL-02)<br>5. Derive the expression for gain and bandwidth of a single tuned amplifier. (BL-02)<br>6. Describe the effect of cascading on bandwidth of tuned amplifiers. (BL-02) | | |
| | **Total hours:** | **48Hours** |

**Text Book(s):**

1. J. Millman and C.C. Halkias, “Integrated Electronics”, McGraw-Hill, 1972.

2. Donald A. Neaman, “Electronic Circuit Analysis and Design”, McGraw Hill.

3. Electronic Circuit Analysis 4th Edition – by K. Lal Kishore , BS Publications.

**Reference Book(s):**

1. Robert T. Paynter, “Introductory Electronic Devices and Circuits”, Pearson Education, 7th Edition

2. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory” Pearson/Prentice Hall, 9th Edition, 2006.

3. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, Oxford University Press, 5th Edition.

4. Salivahanan, N.Suressh Kumar, A. Vallavaraj, “Electronic Devices and Circuits”, Tata McGraw Hill, Second Edition

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21EC2501 | **ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB** | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| IV | 0 | 0 | 3 | 36 | 1.5 | 40 | 60 | 100 |

**Pre-requisite: Basic knowledge on amplifiers and oscillators.**

**Course Objectives:**

1. Analyze amplifiers for frequency response
2. Analyze feedback circuits, amplifier circuits and oscillator circuits
3. Design and construct simple electronic circuits to accomplish a specific function, e.g., designing amplifiers

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | Measure various parameters of analog circuits and compare experimental results in the laboratory with theoretical analysis. **(BL-3)** |
| **CO 2** | Analyze negative feedback amplifier circuits, oscillators, Power amplifiers, Tuned amplifiers.**(BL-4)** |
| **CO 3** | Design analog electronic circuits using discrete components **(BL-3)** |
| **CO 4** | Design RC and LC oscillators, Feedback amplifier for specified gain and multistage amplifiers for Low, Mid and high frequencies. **(BL-3)** |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **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** |
| **CO1** | | | | 1 | | | | | | 1 | | | | |
| **CO2** | 2 | 2 | | | 2 | | | | | 1 | 1 | | | 1 |
| **CO3** | 2 | 2 | 2 | 1 | 2 | | | | | 1 | 1 | 1 | 1 | 1 |
| **CO4** | | | 2 | | 2 | | | | | 1 | 1 | 1 | 1 | 1 |

1: Low, 2-Medium, 3- High

| **COURSE CONTENT** | **CO** |
|---|---|
| **Task-1 : COMMON EMITTER AMPLIFIER** | |
| **Objective:** Design voltage divider based Common Emitter amplifier with discrete components and calculate the bandwidth of amplifier from its frequency response. | CO1 |
| **Task-2: RC COUPLED AMPLIFIER** | |
| **Objective:** Design two stage RC coupled amplifier for given specifications. Determine Gain and Bandwidth from its frequency response curve. | CO 1 |
| **Task-3: DARLINGTON AMPLIFIER** | |
| **Objective:** Design Darlington amplifier and determine gain and bandwidth from frequency response.. | CO 2 |
| **Task-4: CASCODE AMPLIFIER** | |
| **Objective:** Design cascode amplifier and determine gain and bandwidth from frequency response | |
| **Task-5: VOLTAGE SERIES FEEDBACK AMPLIFIER** | |
| **Objective:**Design voltage series feedback amplifier for the given specifications. Determine the effect of feedback on the frequency response of a voltage series feedback amplifier. | CO 2 |
| **Task-6 : CURRENT SHUNT FEEDBACK AMPLIFIER** | |

| | |
|---|---|
| **Objective:** Design and simulate current shunt feedback using PSPICE/Multisim and determine the effect of feedback on the frequency response | CO 2 |
| **Task-9: RC PHASE SHIFT OSCILLATOR** | |
| **Objective:** Design and simulate RC Phase shift oscillator for the given specification using PSPICE /Multisim. Determine the frequency of oscillation using simulation tool. | CO 2 |
| **Task-10 :HARTLEY OSCILLATOR** | |
| **Objective:** Design and simulate Hartley oscillator using PSPICE /Multisim and determine the frequency of oscillations.. | CO 2 |
| **Task-9: COLPITTS OSCILLATOR** | |
| **Objective:** Design and simulate Colpitts oscillator using PSPICE /Multisim and determine the frequency of oscillations. | CO 4 |
| **Task-11: CLASS-A POWER AMPLIFIER** | |
| **Objective:** Design and simulate class A power amplifier using PSPICE /Multisim,find out the efficiency and Plot the output waveforms. | CO 4 |
| **Task-12: CLASS-B PUSH PULL AMPLIFIER** | |
| **Objective:** Design and simulate class B push-pull amplifier using PSPICE /Multisim, find out the efficiency and Plot the output waveforms. | CO 2 |
| **Task-12: SINGLE TUNED AMPLIFIER** | |
| **Objective:** Design and simulate single tuned voltage amplifier using PSPICE /Multisim and determine the resonant frequency and bandwidth. | CO 2 |

**Text Book(s):**


1. Introduction to PSPICE Using OrCAD for Circuits and Electronics by Rashid Muhammad H
2. PSPICE and MATLAB for electronics: An integrated approach by John o. Attia
3. Fundamentals of Electronic Circuit Design, Getting Started: MultiSim Textbook EditionbyDavid J. Comer, Donald T. Comer.


**Reference Book(s):**


1. A Guide to Circuit Simulation and Analysis Using PSPICE by Paul W. Tuinenga
2. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory” Pearson/Prentice Hall, 9th Edition, 2006.
3. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, Oxford University Press, 5th Edition.

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21EC2004 | CONTROL SYSTEMS | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| IV | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

**Pre-requisite:** Basics concepts of Electrical Circuits & Basics of Laplace transform

**Course Objectives:**

1. To understand the merits and demerits of open and closed loop control systems
2. To understand the step response of second order control systems
3. To plot Root locus for the given system transfer function
4. To understand the stability analysis from Bode plot, polar plots
5. To understand the merits of state space analysis over time domain analysis

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | Solve the transfer function for the given electrical or mechanical systems. **(BL=3)** |
| **CO 2** | Explain the control system behaviour in time domain for step signal with various damping's. **(BL=2)** |
| **CO 3** | Analyze the stability of given system by using Routh's stability criteria and Root locus plot. **(BL=4)** |
| **CO 4** | Analyze the stability of given system by means of Bode plot, polar plot & Nyquist plot **(BL=4)** |
| **CO 5** | Analyze controllability & observability for the given state model. **(BL=4)** |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| CO1 | 3 | 2 | | | | | | | | | | | 2 | 3 |
| CO2 | 3 | 2 | | 2 | 2 | | | | | | | | 2 | 3 |
| CO3 | 3 | 1 | | | 2 | | | | | | | | 2 | 2 |
| CO4 | 2 | 3 | 2 | | | | | | | | | | 2 | 3 |
| CO5 | 1 | 1 | | | | | | | | | | | 3 | 3 |

1- Low, 2-Medium, 3- High

**COURSE CONTENT**

| MODULE – 1 | INTRODUCTION TO CONTROL SYSTEMS | 9 hrs |
|---|---|---|

Examples &Classification of control systems, merits and demerits of Open Loop and closed loop control systems, Effects of positive and negative feedback

Mathematical modelling and transfer function of Electrical and Mechanical systems, Analogous systems.

Control System Components: DC Servo motor, AC Servo motor , Synchro Transmitter & Receiver (2h)

Block diagrams:Block diagram representation of control systems, Block Diagram Reduction Rules .(4h)

Signal flow graph: Definitions, Reduction using Mason's gain formula.(3h)

At the end of the Module 1, students will be able to:

1.Identify the difference between open loop and closed loop systems **(BL=3)**

2.Understand the effect of feedback on system performance **(BL=2)**

3. Apply the block diagram reduction to simplify the given system **(BL=3)**

| MODULE-2 | TIME RESPONCE ANALYSIS | 10hrs |
|---|---|---|

Standard test signals, Time response of first order and second order un damped, under damped, critically damped and over damped systems, Time domain specifications. (6h)

Error Analysis: Steady state Error, static error coefficient of type 0,1, 2 systems(3h)

At the end of the Module 3, students will be able to:

1. Understand the importance of basic test signals . **(BL=2)**
2. Understand the Time response of second order system with different dampings . **(BL=2)**
3. Find steady state error for the given system for any input signal. . **(BL=1)**

| **MODULE-3** | **STABILITY ANALYSIS** | **10 hrs** |
|---|---|---|

Stability: The concept of stability, Routh's stability criterion, limitations of Routh's stability.(4h)
Root locus plot: The root locus concept, construction of root loci, effects of adding poles and zeros to G(s)H(s) on the root loci. (5h)

At the end of the Module 4, students will be able to:

1. Understand various stability issues **(BL=2)**
2. Apply Routh's stability criteria to given system for stability assessment **(BL=3)**
3. construct the Root locus plot for the given system **(BL=3)**

| **MODULE-4** | **FREQUENCY RESPONSE ANALYSIS** | **10 hrs** |
|---|---|---|

Introduction, Frequency domain specifications, Bode plot, polar plot, Transfer function from the Bode Diagram, Stability Analysis from Bode Plots. Polar Plots, Nyquist Plots. (8h)
Compensation Techniques: Lag, Lead, Lag-Lead Compensators.(3h)

At the end of the Module 5, students will be able to:

1. Understand various frequency domain specifications. **(BL=2)**
2. Explain the Bode plot for the given system. **(BL=2)**
3. Find the stability of given system from Bode plot and polar plot. **(BL=1)**

| **MODULE-5** | **STATE SPACE ANLYSIS** | **9 hrs** |
|---|---|---|

Introduction:Concepts of state, state variables and state model, derivation of state models from differential equations, Diagonalization. (5h)
Solution of state equation:Solving the Time invariant state Equations, State Transition Matrix and it's Properties. (2h)
The concepts of controllability and observability. (2h)

At the end of the Module 6, students will be able to:

1. Understand the importance of state space analysis **(BL=2)**
2. Find the state model for the given transfer function through various techniques. **(BL=1)**
3. Examine the controllability and observability of the given state model. **(BL=1)**

| **Total hours:** | **48 hours** |
|---|---|

**Text Book(s):**

1."Control Systems Engineering, I. J. Nagrath and M. Gopal, New Age International Publishers, 5th edition, 2007, Reprint 2012.

2. Control Systems by A. Anand Kumar, PHI Learning pvt. Ltd., second edition

**Reference Book(s):**

1. Norman S. Nise, "Control Systems Engineering", John Wiley & Sons PTE Ltd, 2013
2. Modern Control Engineering, Katsuhiko Ogata, PEARSON, 1st Impression 2015.
3. Automatic Control Systems, Farid Golnaraghi and Benjamin. C. Kuo, WILEY, 9th Edition, 2010.
4. N C Jagan, "Control Systems", BS Publications, 1st Edition, 2007.
5. S Palani, "Control Systems Engineering", Tata McGraw-Hill Publications, 1st Edition, 2001.
6. N K Sinha, "Control Systems", New Age International Publishers, 1st Edition, 2002.

| NARAYANA ENGINEERING COLLEGE :: GUDUR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21EC2005 | ELECTROMAGNETIC WAVES AND TRANSMISSION LINES | | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| IV | 3 | 0 | 0 | 48 | 3 | 40 | 60 | 100 |

**Pre-requisite:** Vector Calculus, Knowledge of Integration and differentiation.

**Course Objectives:**

1. To study different coordinate systems, Physical significance of Divergence, Curl and Gradient.
2. To acquire knowledge on electric and magnetic fields in both static and dynamic domains.
3. To understand wave concept with the help of Maxwell's equations.
4. To Analyze reflection and refraction of EM waves and Electromagnetic wave propagation in different media.
5. To introduce concepts of polarization and fundamental theory of electromagnetic waves in transmission lines and their practical applications.

**Course Outcomes**: After successful completion of the course, the student will able to :

| | |
|---|---|
| **CO 1** | Apply the Coulomb's law and Gauss law for different charge distributions.**(BL-3)** |
| **CO 2** | Apply Biot-Savart's Law and Ampere's Circuit law to static current distributions.(**BL-03)** |
| **CO 3** | Apply Maxwell's equations for time varying electromagnetic fields **(BL-3)** |
| **CO 4** | Interpret the wave propagation through different mediums. **(BL-2)** |
| **CO 5** | Understand the concept of transmission lines & their applications. **(BL-2)** |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| CO1 | 3 | 2 | 1 | 1 | | | | | | | | 1 | 3 | |
| CO2 | 3 | 2 | 1 | 1 | | | | | | | | 1 | 3 | |
| CO3 | 3 | 2 | 1 | 1 | | | | | | | | 1 | 2 | |
| CO4 | 1 | 1 | | 2 | | | | | | | | 1 | 3 | 2 |
| CO5 | 2 | 1 | | 2 | | | | | | | | 1 | 2 | 2 |

1- Low, 2-Medium, 3- High

**COURSE CONTENT**

| MODULE – 1 | Electrostatics | 13 Hrs |
|---|---|---|

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Electric dipole, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

At the end of the Module 1, students will be able to:

1. Summarize basic laws of static electric field. (BL-2)
2. Derive the Maxwell's equations for electrostatic fields. (BL-3)
3. Solve problems applying laws of electrostatics. (BL-3)
5. Explain electric energy and potential (BL-2)
6. Define currents of conductors and dielectrics (BL-1)
7. Illustrate Poisson's and Laplace's Equations (BL-2)

8. Summarize types of capacitors (BL-2)

| MODULE -2 | Magneto statics | 9 Hrs |
|---|---|---|

Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Magnetic torque and moment, Magnetic dipole, Inductances and Magnetic Energy, Illustrative Problems.

At the end of the Module 2, students will be able to:

1. Summarize basic laws of static magnetic field. (BL-2)
2. Derive the Maxwell's equations for magnetic fields. (BL-3)
3. Solve problems applying laws of magneto statics. (BL-3)

| MODULE-3 | Maxwell's Equations for Time Varying Fields | 6 Hrs |
|---|---|---|

Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Forms and Word Statements. Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

At the end of the Module 3, students will be able to:

1. Derive Maxwell's equations for time varying electromagnetic fields. (BL-3)
2. Apply the boundary conditions of EM fields at the interface of different media.(BL-3)
3. Solve problems on time varying maxwell's equations of electromagnetic fields. (BL-3)

| MODULE-4 | EM Wave Characteristics | 12 Hrs |
|---|---|---|

Wave Equations ,Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation, Polarization,Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

At the end of the Module 4, students will be able to:

1. Derive wave equations for different media. (BL-3)
2. Explain concept of polarization of electromagnetic waves. (BL-2)
3. Solve problems using wave characteristics equations (BL-3)
4. Explain principles of reflections and refraction for different incidences. (BL-2)
5. Explain concept of power flow using Pointing vector. (BL-2)
6. Solve problems on Brewster angle, power flow and surface impedance. (BL-3)

| MODULE-5 | Transmission Lines | 8 Hrs |
|---|---|---|

Introduction, Transmission line parameters (Primary and Secondary), Transmission line equations, Input impedance, Standing wave ratio & power, Smith chart & its applications, Applications of transmission lines of various lengths, Micro-strip transmission lines – input impedance, Illustrative Problems.

At the end of the Module 6, students will be able to:

1.Study the principles of transmission lines and concept of smith chart.(BL-2)
2.Derive the input impedance of transmission line.(BL-3)
3. Calculate the line parameters through problem solving.(BL-3)
4.Study the applications of different lengths of transmission lines.(BL-2)

| Total Hours: | 48 Hours |
|---|---|

**Text Book(s):**

1. Matthew N.O. Sadiku, S.V.Kulkami, “Elements of Electromagnetics”, Oxford Univ. Press, 6th ed., 2015.
2. William H. Hayt Jr. and John A. Buck, “Engineering Electromagnetics”, TMH, 7th ed., 2006.

**Reference Book(s):**

1. E.C. Jordan and K.G. Balmain, “Electromagnetic Waves and Radiating Systems”, 2nd Edition, PHI, 2000
2. John D. Krauss, “Electromagnetics”, 4th Edition,McGraw- Hill publication1999.

| NARAYANA ENGINEERING COLLEGE:GUDUR | | | | | | | |
|---|---|---|---|---|---|---|---|
| 21EC2502 | MATLAB AND SIMULINK LAB | | | | | | R21 |
| Semester | Hours / Week | | | Total hrs | Credit | Max Marks | |
| | L | T | P | | C | CIE | SEE | TOTAL |
| IV | 0 | 0 | 2 | 36 | 1 | 40 | 60 | 100 |

**Pre-requisite: Knowledge on MATLAB Basics.**

**Course Objectives:**

1. To provide practical exposure with generation and simulation of basic signals using standardized tools.
2. To analyze signals and sequences using Fourier, Laplace and Z-transforms.
3. To apply Matlab tools for writing programs.

**Course Outcomes**: After successful completion of the course, the student will be able to:

| | |
|---|---|
| **CO 1** | Demonstrate knowledge in<br>• Operations on Matrices.<br>• Generation of Various signals and Sequences.<br>• Convolution and Correlation of signals and Sequences. **(BL-2)** |
| **CO 2** | Understand the different operation that can be performed on signals and sequences. **(BL-2)** |
| **CO 3** | Apply different transforms on a given signal to draw magnitude and phase spectrum. **(BL-3)** |
| **CO 4** | Identify whether the given system is linear or non-linear and time variant or invariant. **(BL-3)** |
| **CO 5** | Understand the verification of sampling theorem. **(BL-2)** |

**CO-PO Mapping**

| CO | PO | | | | | | | | | | | | PSO | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| CO1 | 1 | 1 | | | | | | | 2 | | | | 1 | 2 |
| CO2 | 2 | 1 | | | | | | | 1 | | | 2 | 1 | 2 |
| CO3 | 2 | 2 | 2 | 1 | | | | | 3 | | | 1 | 1 | 2 |
| CO4 | 2 | 2 | 2 | 1 | | | | | 2 | | | 1 | 2 | 2 |
| CO5 | 2 | | | | | | | | 1 | | | 1 | 1 | 2 |

1: Low, 2-Medium, 3- High

| COURSE CONTENT | CO |
|---|---|
| **Task-1: INTRODUCTION TO MATLAB** | |
| **Objective:** To familiarize MATLAB Tool. | **CO1** |
| **Task-2: OPERATIONS ON MATRICES** | |
| **Objective:** To write a MATLAB program to perform various mathematical operations on matrices.<br>A. Addition of two N×N matrices<br>B. Subtraction of two N×N matrices<br>C. Multiplication of two N×N matrices<br>D. Inverse of a matrix<br>E. Eigen values of a matrix | **CO 1** |
| **Task-3: GENERATION OF SIGNALS AND SEQUENCES** | |
| **Objective:**To write a MATLAB program to generate various signals and Sequences such as unit Impulse, Unit Step, Square, Sawtooth, Triangular, Sinusoidal, Ramp, sinc function. | CO 1 |

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| **Task-4: OPERATIONS ON SIGNALS AND SEQUENCES** | |
| **Objective:** To write a MATLAB program to perform various operations on signals and sequences such as<br>A. Addition<br>B. Multiplication<br>C. Scaling<br>D. Shifting<br>E. Folding | CO 2 |
| **Task-5: ENERGY AND POWER OF A SIGNAL** | |
| **Objective:** To write a MATLAB program to find Energy and power of a given signal. | CO 1 |
| **Task-6: CONVOLUTION AND CORRELATION OF SIGNALS AND SEQUENCES** | |
| **Objective:** To write a MATLAB program to perform convolution and correlation of given signals and sequences using MATLAB. | CO 1 |
| **Task-7: FOURIER TRANSFORM OF A SIGNAL** | |
| **Objective:** To write a MATLAB program to find the Fourier Transform of a Signal and plot its Magnitude and Phase Spectrum. | CO 3 |
| **Task-8: VERIFICATION OF LINEARITY AND TIME INVARIANCE PROPERTIES** | |
| **Objective:**To write a MATLAB program to verify Linearity and Time Invariance properties of Continuous/Discrete Systems. | CO 4 |
| **Task-9: LAPLACE TRANSFORM OF CONTINUOUS SIGNAL** | |
| **Objective:** To write a MATLAB program to find the Laplace transform of a signal. | CO 3 |
| **Task-10: Z-TRANSFORM OF DISCRETE SIGNAL** | |
| **Objective:** To write a MATLAB program to find the Z-transform of a discrete signal. | CO 3 |
| **Task-11: GAUSSIAN NOISE** | |
| **Objective:** To write a MATLAB program to generate Complex Gaussian noise and find its mean, variance, Probability Density Function (pdf) and Power Spectral Density (PSD) | CO 1 |
| **Task-12: VERIFICATION OF SAMPLING THEOREM** | |
| **Objective:** To write a MATLAB Program to verify Sampling theorem | CO 4 |

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| **Additional Experiments:** | |
| **Task-13: LOCATING ZEROS AND POLES** | |
| **Objective:** To write a MATLAB program to Locate Zeros and Poles and plot in S-Plane or Z-Plane for the given Transfer Function. | CO 3 |

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| **Task-14: DETECTION OF NOISE BY CORRELATION** | |

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|---|---|
| **Objective:** To write a MATLAB program to detect Noise by Auto Correlation / Cross correlation. | CO 1 |

**Text Book(s):**


1. A.V. Oppenheim, A.S.Willsky and S.H. Nawab, "Signals and Systems", 2ndEdition, PHI, 2009.
2.MATLAB for Beginners:A Gentle Approach,Petra Books,Peter I.Kattan,ISBN: 978-1438203096
3.Stormy Attaway, "Matlab: a Practical Introduction to Programming and Problem Solving", Elsevier.


**Reference Book(s):**


1.Signals & Systems Using MATLAB **Luis F. Chaparro andAydin Akan,3rd Edition ,2019**
**2.** Signals & Systems Using MATLAB **Alan V. Oppenheim**,**Alan S. Willsky**, *MIT*
**S. Hamid Nawab,2ndEdition ,1997**
3. Simon Haykin and Van Veen, "Signals & Systems", 2ndEdition, Wiley, 2005.
4. A. Anand Kumar, Signals & Systems, PHI, 2011.
5. B.P. Lathi, Principles of Linear Systems and Signals, Oxford University Press, 2nd Edition, 2013.
6.Signals and Systems, J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, TMH