

M.E. VLSI DESIGN AND EMBEDDED SYSTEMS

(Affiliated to Anna University, Chennai)

PROGRAMME BROCHURE



Offered by

DEPARTMENT OF ELECTRICAL, ELECTRONICS AND COMMUNICATION ENGINEERING
NATIONAL INSTITUTE OF TECHNICAL TEACHERS TRAINING AND RESEARCH
(Ministry of Education, Govt. of India} Taramani, Chennai - 600 113, India



About NITTTR, CHENNAI

National Institute of Technical Teachers Training and Research (NITTTR), Chennai was established in 1964 by the Government of India as a key catalyst institution for ensuring quality in technical education in South India comprising the States of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana and Union Territory of Pondicherry. This Institute being a Resource Institute offers educational services in curriculum/material/ institutional Development, Instructional Methods, Media, Examination Reforms, Continuing Education, Distance Learning, Training and Development, Educational Psychology, Educational Management and Research. The Institute strives continuously and vigorously to achieve greater heights of excellence by actively collaborating with National and International agencies on projects and programmes aimed at quality improvement of technical education systems

DEPARTMENT OF ELECTRICAL, ELECTRONICS AND COMMUNICATION ENGINEERING

Established in the year 1964, Electrical, Electronics & Communication Engineering(EE&CE) Department is organizing about 30 programmes throughout the year in 20 different areas for teachers of Polytechnic & Engineering Colleges from India. The Department is conducting Overseas Training Programmes every year for two months duration to train the International faculty members in the emerging electronics areas. Training programmes organized in the department are practically oriented to enable the participants to gain confidence in handling the subjects. The training will be given by the eminent Professors, Experts and related Software Professionals from various Universities, IIT's, NITTTRs and Industries. Participants will be getting industrial exposure by arranging industrial visits and training in the industrial environment. EE&CE Department has offered customized training programmes for Industries like Andrew Yule, Visteon and has also trained PWD officials. As per NITTTRs mandate, the Department faculty members are involved in revising the curriculum of Polytechnic, University/Engineering college programme from time to time. The Department is organizing many workshops/ seminars/ conferences in emering areas in the field of Electrical, Electronics and Communication. The Department has conducted International/National Programmes/ workshops/ seminars/ webinar in collaboration with PSC Manila and UNESCO. The Department also offers consultancy in setting up of centres of excellence and other project works. Department has purchased the latest equipment to train the fa culties in the current trends.

VISION

To serve as centre of excellence in promoting need based training programme and Research in Electrical Electronics and Communication Engineering



MISSION

To design and develop need based training programs for the faculty of Polytechnic & Engineering Colleges and working Professionals of Industry and Government Organizations.

To offer International Training Programs on emerging areas of Electrical, Electronics and Communication Engineering for the Teachers and working professionals of various Counties under ITEC scheme Of Ministry of External Affairs, Government of India.

To develop new innovative short-term and long-term programs by collaborating with Universities and Institutes of Higher Learning for developing Electrical, Electronics and Communication Engineering Teachers to meet the requirements of Engineering Educational Institutions.

To provide support services to the Government of India schemes related to the technical and vocational education system and as entrusted by MHRD, Government of India, from time to time.

To offer research, testing services for Industries and Govt. Organizations.

To establish partnership with Industries for offering Skill based Training Programs for Industrial Personnel and Industrial Training for the faculty of Polytechnic and Engineering Colleges.

To design new instructional systems and strategies for the production of multimedia learning resources and transfer through the latest technologies including broadcasting and webcasting/ multicasting. To offer faculty exchange programs by linking with various Universities of India and abroad.

AREAS OF SHORT - TERM COURSES CONDUCTED BY THE DEPARTMENT

PLC and SCADA

- ▶ Industrial Automation
- ▶ Digital and Mobile Communication
- ▶ 8051 Micro Controller and its applications
- ▶ PIC 16F877 Microcontroller and its applications
- ▶ Data Communication and Networking
- ▶ MATLAB Programming for Simulation and Design
- ▶ Digital Design using Verilog and implementation using FPGA
- ▶ Graphical System Design using LabVIEW
- ▶ Digital Signal Processing
- ▶ Advanced Communication Systems
- ▶ ARM Controller LPC2148
- ▶ Power Electronics

Verilog Programming and Implementation using FPGA

- ▶ Virtual Instrumentation
- ▶ VHDL Programming and Implementation using FPGA
- ▶ Wireless Communication
- ▶ Special Electrical Machines and Control
- ▶ Arduino and Raspberry Pi Programming
- ▶ Electrical Systems for Wind and Solar
- ▶ Sensor Applications using MyRIO
- ▶ Biomedical Electronics and IoT in Healthcare
- ▶ Electrical CAD
- ▶ Internet of Things(IoT)
- ▶ Electric Vehicle Engineering
- ▶ Circuit Simulation and PCB Design

M.E. VLSI DESIGN AND EMBEDDED SYSTEMS

VLSI is an important skill which is required in the electronics industry whereas professionals skilled in Embedded systems are high in demand in the semiconductor and microprocessor industry. India offers lucrative jobs for the professionals trained in VLSI and Embedded systems

VLSI and Embedded systems has emerged as a one stop career destination for candidates having interest in electronics and hardware-software. This programme is not alone focusing on the emerging areas, but also develop problem analysis and design skills of the students in the domain. Industry experts also will be involved in handling classes and students will be able to interact with different industry experts. The uniqueness of this programme is to encourage the students to undergo the Industrial problem based projects. Hence the students who are undertaking these programmes will gain knowledge in solving Industry based Problems and develop expertise in research and development to cater to needs of the society. Both embedded systems and VLSI professionals have enormous job opportunities and are having high demand.

FACULTY OF THE DEPARTMENT



Dr. G.A. Rathy.

Professor and Head



Dr. G. Kulanthaivel.

Professor



Dr. P. Sivashankar.

Professor

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- ▶ To enrich students to excel in research leading to cutting edge technology in VLSI design and embedded systems and creating competent, innovative, and productive professionals in this field.
- ▶ To provide students with a solid foundation in digital and computer architecture principles leading to VLSI design.
- ▶ To understand the various applications and employ embedded systems to find solutions to them with good scientific and engineering knowledge so as to comprehend, analyze, design, and create novel products and solutions for the real life problems.
- ▶ To provide students with an academic environment aware of excellence, leadership, ethical conduct, positive attitude, societal responsibilities and the lifelong learning needed for a successful professional career.
- ▶ To inculcate entrepreneurial skills in starting industries applying embedded system technologies.

PROGRAMME OUTCOMES (POs): On successful completion of the programme,

- ▶ Graduates will be able to apply the knowledge of computing, mathematics, science and electronic engineering for designing VLSI circuits.
- ▶ Graduates will have an ability to identify, formulate, investigate and solve the issues related to the design of VLSI and embedded systems.
- ▶ Graduates will have an ability to design and conduct experiments, perform analysis and interpret the problems of VLSI design and embedded systems.
- ▶ Graduates will be able to demonstrate the design of an embedded system, component or process as per needs and specifications.
- ▶ Graduates will demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks.
- ▶ Graduates will have the skills to use modern engineering tools, softwares and equipments to analyze problems.
- ▶ Graduates will demonstrate knowledge of professional and ethical responsibilities.
- ▶ Graduate will be able to communicate effectively in both verbal and written form.
- ▶ Graduate will show the understanding of the impact of engineering solutions on the society and also will be aware of contemporary issues.
- ▶ Graduate will develop confidence in self education and ability for lifelong learning.

| Programme Educational Objectives | Programme Outcomes | | | | | | | | | |
|----------------------------------|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| I | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| II | | ✓ | ✓ | | ✓ | ✓ | | | | |
| III | | | | ✓ | ✓ | ✓ | ✓ | | | |
| IV | | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ |
| V | | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ |

| YEAR | SEM | SUBJECTS | PROGRAM EDUCATIONAL OBJECTIVES | | | | | | | | | |
|--------|-----|--|--------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|
| | | | PE1 | PE2 | PE3 | PE4 | PE5 | PE6 | PE7 | PE8 | PE9 | PE10 |
| First | I | Advanced Applied Mathematics | ✓ | ✓ | | | ✓ | | | | ✓ | |
| | | Digital Integrated Circuit Design | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| | | Introduction to Embedded Controllers | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | |
| | | CMOS Analog IC Design | | ✓ | ✓ | | ✓ | ✓ | | | | |
| | | Design for Testability | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| | | Elective-I | | | | | | | | | | |
| | II | Analog & Digital System Design Lab | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| | | Real Time Embedded Systems | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | |
| | | VLSI Architectures for System Design | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| | | Hardware-Software Co-design of Embedded system | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Second | III | Low Power VLSI Design | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ |
| | | Elective-II | | | | | | | | | | |
| | | Elective-III | | | | | | | | | | |
| | | Embedded Systems Lab | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| | IV | Technical Seminar and Report Writing | | | | | | | | | | |
| | | SoC design for Embedded System | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |

The programme will have Core courses, Elective courses and Project works. The project may also have seminar, practical/Industrial training summer project.

SEMESTER - I

| SL. NO | COURSE CODE | COURSE TITLE | CATEGORY | CONTACT PERIODS | L | T | P | C |
|-------------------|-------------|--------------------------------------|----------|-----------------|----|---|---|----|
| THEORY | | | | | | | | |
| 1. | MA7152 | Advanced Applied Mathematics | FC | 4 | 4 | 0 | 0 | 4 |
| 2. | VE7103 | Digital Integrated Circuit Design | PC | 3 | 3 | 0 | 0 | 3 |
| 3. | VE7104 | Introduction to Embedded Controllers | PC | 3 | 3 | 0 | 0 | 3 |
| 4. | VE7101 | CMOS Analog IC Design | PC | 3 | 3 | 0 | 0 | 3 |
| 5. | VE7102 | Design for Testability | PC | 3 | 3 | 0 | 0 | 3 |
| 6. | | Elective-I | | 3 | 3 | 0 | 0 | 3 |
| PRACTICALS | | | | | | | | |
| 7. | VE7111 | Analog and Digital System Design Lab | PC | 4 | 0 | 0 | 4 | 2 |
| TOTAL | | | | 23 | 19 | 0 | 4 | 21 |

SEMESTER - II

| SL. NO | COURSE CODE | COURSE TITLE | CATEGORY | CONTACT PERIODS | L | T | P | C |
|-------------------|----------------|--|----------|--------------------|-----------|----------|----------|-----------|
| THEORY | | | | | | | | |
| 1. | NE7251 | Real Time Embedded System | PC | 3 | 3 | 0 | 0 | 3 |
| 2. | VE7202 | VLSI Architectures for System Design | PC | 3 | 3 | 0 | 0 | 3 |
| 3. | VE7201 | Hardware Software Co Design of Embedded System | PC | 3 | 3 | 0 | 0 | 3 |
| 4. | VL7252 | Low Power VLSI Design | PC | 3 | 3 | 0 | 0 | 3 |
| 5. | | Elective-II | PE | 3 | 3 | 0 | 0 | 3 |
| 6. | | Elective-III | PE | 3 | 3 | 0 | 0 | 3 |
| PRACTICALS | | | | | | | | |
| 7. | VE7211 | Embedded Systems Lab | PC | 4 | 0 | 0 | 4 | 2 |
| 8. | VE7212 | Technical Seminar and Report Writing | EEC | 2 | 0 | 0 | 2 | 1 |
| TOTAL | | | | 24 | 18 | 0 | 6 | 21 |

III SEMESTER

| SL. NO | COURSE CODE | COURSE TITLE | CATEGORY | CONTACT PERIODS | L | T | P | C |
|-------------------|----------------|--------------------------------|----------|--------------------|----------|----------|-----------|-----------|
| THEORY | | | | | | | | |
| 1. | VE7301 | SoC Design for Embedded System | PC | 3 | 3 | 0 | 0 | 3 |
| 2. | | Elective-IV | PE | 3 | 3 | 0 | 0 | 3 |
| 3. | | Elective-V | PE | 3 | 3 | 0 | 0 | 3 |
| PRACTICALS | | | | | | | | |
| 4. | VE7311 | Project Work Phase – I | EEC | 12 | 0 | 0 | 12 | 6 |
| TOTAL | | | | 22 | 9 | 0 | 12 | 15 |

IV SEMESTER

| SL. No | COURSE CODE | COURSE TITLE | CATEGORY | CONTACT PERIODS | L | T | P | C |
|-------------------|----------------|-------------------------|----------|--------------------|----------|----------|-----------|-----------|
| PRACTICALS | | | | | | | | |
| 1. | VE7411 | Project Work Phase – II | EEC | 24 | 0 | 0 | 24 | 12 |
| TOTAL | | | | 24 | 0 | 0 | 24 | 12 |

FOUNDATION COURSES (FC)

| SL. NO. | COURSE CODE | COURSE TITLE | CATEGORY | CONTACT PERIODS | L | T | P | C |
|-------------------|----------------|------------------------------|--------------|--------------------|----------|----------|----------|----------|
| PRACTICALS | | | | | | | | |
| 1. | | Advanced Applied Mathematics | FC | 4 | 4 | 0 | 0 | 4 |
| | | | TOTAL | 4 | 4 | 0 | 0 | 4 |

PROFESSIONAL CORE (PC)

| SL. NO | COURSE CODE | COURSE TITLE | CATEGORY | CONTACT PERIODS | L | T | P | C |
|-----------|----------------|--|----------|--------------------|---|---|---|---|
| 1. | | Introduction to Embedded Controllers | PC | 3 | 3 | 0 | 0 | 3 |
| 2. | | Digital Integrated Circuit Design | PC | 3 | 3 | 0 | 0 | 3 |
| 3. | | CMOS Analog IC Design | PC | 3 | 3 | 0 | 0 | 3 |
| 4. | | Design For Testability | PC | 3 | 3 | 0 | 0 | 3 |
| 5. | | Real Time Embedded Systems | PC | 3 | 3 | 0 | 0 | 3 |
| 6. | | VLSI Architectures for System Design | PC | 3 | 3 | 0 | 0 | 3 |
| 7. | | Hardware - Software Co-design of Embedded system | PC | 3 | 3 | 0 | 0 | 3 |
| 8. | | Low Power VLSI Design | PC | 3 | 3 | 0 | 0 | 3 |
| 9. | | SoC design for Embedded System | PC | 3 | 3 | 0 | 0 | 3 |
| 10. | | Analog & Digital System Design Lab | PC | 4 | 0 | 0 | 4 | 2 |
| 11. | | Embedded Systems Lab | PC | 4 | 0 | 0 | 4 | 2 |

PROFESSIONAL ELECTIVES (PE)

| SL. NO. | COURSE CODE | COURSE TITLE | CATEGORY | CONTACT PERIODS | L | T | P | C |
|--------------------|------------------------|---|-----------------|----------------------------|----------|----------|----------|----------|
| 1. | NE7072 | ASIC Design | PE | 3 | 3 | 0 | 0 | 3 |
| 2. | VL7073 | VLSI Signal Processing | PE | 3 | 3 | 0 | 0 | 3 |
| 3. | VE7016 | RF IC Design | PE | 3 | 3 | 0 | 0 | 3 |
| 4. | VE7011 | MEMS and Microsystems | PE | 3 | 3 | 0 | 0 | 3 |
| 5. | VE7013 | Nano Electronics | PE | 3 | 3 | 0 | 0 | 3 |
| 6. | VE7018 | VLSI For Wireless Communication | PE | 0 | 3 | 0 | 0 | 3 |
| 7. | VE7015 | Parallel and Reconfigurable Architectures | PE | 3 | 3 | 0 | 0 | 3 |
| 8. | VE7001 | Advanced CMOS Analog IC Design | PE | 3 | 3 | 0 | 0 | 3 |
| 9. | NE7074 | Computational Intelligence | PE | 3 | 3 | 0 | 0 | 3 |
| 10. | AP7073 | Design and Analysis of Computer Algorithms | PE | 3 | 3 | 0 | 0 | 3 |
| 11. | VE7007 | Distributed Embedded Computing | PE | 3 | 3 | 0 | 0 | 3 |
| 12. | VE7017 | Robotics | PE | 3 | 3 | 0 | 0 | 3 |
| 13. | VE7002 | Advanced Embedded System Design | PE | 3 | 3 | 0 | 0 | 3 |
| 14. | NE7071 | Adaptive Signal Processing | PE | 3 | 3 | 0 | 0 | 3 |
| 15. | VE7014 | Network on Chip Design | PE | 3 | 3 | 0 | 0 | 3 |
| 16. | VE7009 | Embedded C | PE | 3 | 3 | 0 | 0 | 3 |
| 17. | VE7003 | Algorithm For VLSI Design Automation | PE | 3 | 3 | 0 | 0 | 3 |
| 18. | VE7008 | Embedded Automotive Systems | PE | 3 | 3 | 0 | 0 | 3 |
| 19. | VE7004 | Computer Aided Design of VLSI Systems | PE | 3 | 3 | 0 | 0 | 3 |
| 20. | VE7005 | Design of Embedded Control System | PE | 3 | 3 | 0 | 0 | 3 |
| 21. | VE7012 | Multi Core Architectures and Programming | PE | 3 | 3 | 0 | 0 | 3 |
| 22. | VE7010 | Embedded Networking | PE | 3 | 3 | 0 | 0 | 3 |
| 23. | NE7076 | Digital Image and Video Processing | PE | 3 | 3 | 0 | 0 | 3 |
| 24. | VE7006 | Digital Signal Processors and Architectures | PE | 3 | 3 | 0 | 0 | 3 |

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

| SL. NO | COURSE CODE | COURSE TITLE | CATEGORY | CONTACT PERIODS | L | T | P | C |
|-------------------|------------------------|--------------------------------------|-----------------|----------------------------|----------|----------|----------|----------|
| 1. | | Technical Seminar and Report Writing | EEC | 2 | 0 | 0 | 2 | 1 |
| 2. | | Project Work Phase –I | EEC | 12 | 0 | 0 | 12 | 6 |
| 3. | | Project Work Phase –II | EEC | 24 | 0 | 0 | 24 | 12 |

CREDITS

The minimum prescribed credits required for the award of the degree shall be within the limits : 65 to 75 (As per Anna University, Chennai)

UNIVERSITY EXAMINATIONS

There shall be an End- Semester Examination of 3 hours duration in each course will be conducted by Anna University, Chennai.



Recruiters for Embedded Systems and VLSI Professionals

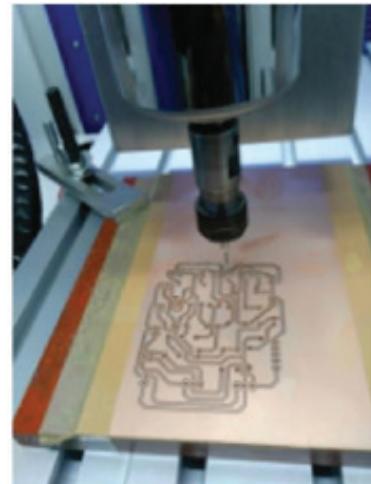
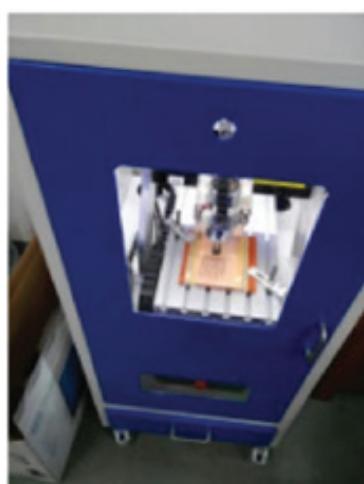
| | |
|-------------------|------------------|
| Intel | Red Pine Signals |
| NVIDIA | Wipro VLSI |
| AMD | Bosch |
| Texas Instruments | Cisco |
| Qualcomm | Juniper Networks |
| Samsung | Google |
| Analog Devices | Sasken |
| LSI | Tata Elxsi |
| Broadcom | Pace |
| Microchip | Philips |

FACILITIES IN THE DEPARTMENT

INDUSTRIAL INSTRUMENTATION & PNEUMATICS LAB



ELECTRONICS DESIGN AND PCB DESIGN LAB



INTERNET OF THINGS (IoT) & CYBER PHYSICAL SYSTEMS LAB



FACILITIES IN THE DEPARTMENT

POWER ELECTRONICS LAB



COMMUNICATION ENGINEERING LAB



BIOMEDICAL ELECTRANICS LAB



VLSI LAB

FACILITIES IN THE DEPARTMENT

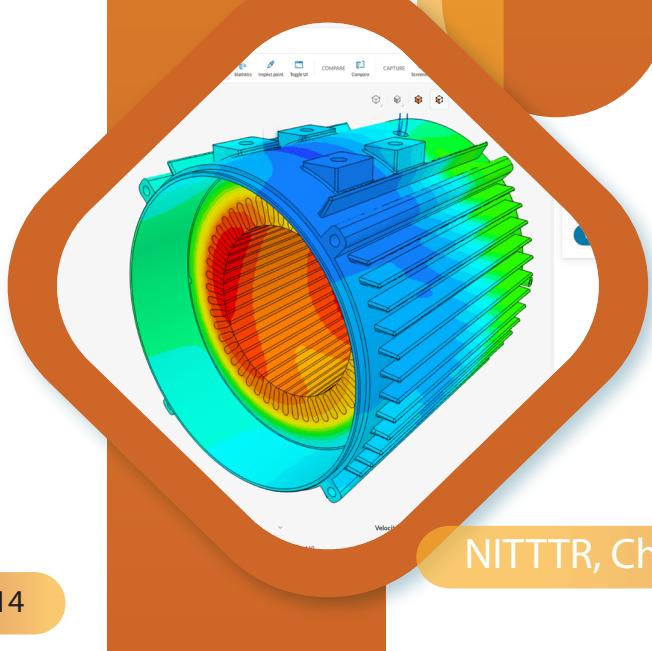
PROGRAMMABLE LOGIC CONTROLLER (PLC) LAB



EMBEDDED SYSTEMS LAB



APPLICATION SOFTWARE AND SIMULATION LAB



NITTTR, Chennai



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