SHIV NADAR

INSTITUTION OF EMINENCE DEEMED TO BE UNIVERSITY

DELHI NCR

BTech Electrical and Computer Engineering

Priorities for our new curriculum

Our curriculum transformation is guided by four strategic priorities that reflect the evolving demands of engineering education and industry needs. These foundational principles ensure our graduates emerge as innovative, adaptable professionals ready to lead in a rapidly changing technological landscape.

- Hands-On Learning
- Interdisciplinary Systems
- Critical Thinking
- Emerging Technologies

Proposed Curriculum (2025 onwards)

Total credits	**163**	
Credit breakup		
Core Common Curriculum (CCC)	16 (min)	40
University Wide Elective (UWE)	16 (min)	
Experiential Learning	8	
Major Core	83	
Major Elective	20	
Major Project 1	6	
Internship/Major Project - 2	6	

Specializations offered – (Applicable for 2025 batch onwards)

- **Modern Energy Systems**
- **Wireless Systems Engineering**
- **VLSI Desig**

Department of Electrical Engineering

School of Engineering

UG Prospectus B.Tech. ECE with Specialization

I. Overview of Department of Electrical Engineering

The Electrical Engineering (EE) department is part of the School of Engineering (SoE) at SNU. Its vision is to be a catalyst in imparting quality education and conducting valued research for the benefit of society. Historically, the field of electrical engineering is one of the most important engineering disciplines that have changed the course of the world. Some of our important areas of teaching are electrical machines and drives, power electronics, power systems, integrated circuits and systems, control systems, machine intelligence, communication systems and signal processing. Sufficient emphasis is given to practical teaching and hands-on learning. Relevant laboratories have been established to meet the requirements of teaching and research. The vision of the department is to establish itself as a center of excellence in terms of research and teaching in its chosen areas. We are committed to establishing human and material infrastructure towards this cause. The department has formed research groups in some of the key areas and is in the process of collaborating with various renowned institutions.

The undergraduate program is broad-based and founded on the pedagogy of learning by doing. The postgraduate programs are getting formulated and are intended to provide advanced degrees in contemporary areas of industrial relevance. They also provide platforms for research avenues. The department has a vibrant doctoral research program. The doctoral program aims to conduct research both in fundamental and applied areas for societal use. The programs intend to fill the dearth in the supply of highly skilled professionals. It will also enable the students to gain high-end skills for intellectually challenging careers in industry. Our aim is to invoke in our students a sense of curiosity to question and to motivate them to think deeply about theoretical and applied problems in technology for society's needs.

Presently the EE department offers the following programs: -

Undergraduate Programs:

Bachelor of Technology in Electrical and Computer Engineering (B. Tech. in ECE)

- with the option of doing minor in any other stream of interest.
- with the option of doing Specialization in any of the FOUR areas of interest.

Detailed rules and regulations regarding B.Tech. Program in SNU can be found in UG handbook.

Doctoral Programs:

(I) Ph.D. in Electrical Engineering / Electronics and Communication Engineering

Credit Break-up of UG Curriculum in Electrical and Computer Engineering

Total number of Credits:		**163**	
S. No.	**Category**	**Credits**	
1	Core Common Curriculum (CCC)	16 (min)	**40**
2	University Wide Elective (UWE)	16 (min)	
3	Experiential Learning	**8**	
4	Major Core	**83**	
5	Major Elective	**20**	
6	Major Project-1	**6**	
7	Internship / Major Project-2	**6**	
	Total Credits	**163**	

Specializations Offered (Within Department):

1. Modern Energy Systems
2. Wireless Systems Engineering
3. VLSI Design

Interdisciplinary Specializations Offered:

1. Applied Machine Intelligence
2. E-Mobility
3. Cognitive Robotics
4. Real-Time Embedded Systems

Detailed Break up of Semester-wise Courses

Semester 1 (20 credits)				
Course Code	**Course Title**	**L:T:P (Credits)**	**Category**	**Prerequisites**
CSD1001	Problem Solving Using Programming	3-0-1 (4)	Major Core	
MAT1003	Multivariate Calculus	3-1-0 (4)	Major Core	
PHY1001	Fields, Waves & Quanta	3-1-1 (5)	Major Core	
ECE1001	The Electron's Path: Fundamentals of EEE	2-0-1 (3)	Major Core	
SOE4801	Introduction to Engineering: Ideas to Impact	1-0-1 (2)	Experiential Learning	
SNS1001	Nature's Code: Chemistry & Biology	2-0-0 (2)	Major Core	

Semester 2 (18 credits)				
Course Code	**Course Title**	**L:T:P (Credits)**	**Category**	**Prerequisites**
MAT1004	Linear Systems and Transforms	3-1-0 (4)	Major Core	
MED1001	The Matter of Materials	2-0-0 (2)	Major Core	
CED1001	Forces in Action	2-0-1 (3)	Major Core	
SOE4802	Design to Reality: CAD & 3D Printing	0-1-1 (2)	Experiential Learning	
ECE1002	Connected Intelligence: Sensors and IoT	2-0-1 (3)	Major Core	
	Environmental & Sustainability	3-0-1 (4)	CCC	

Semester 3 (22 credits)				
Course Code	**Course Title**	**L:T:P (Credits)**	**Category**	**Prerequisites**
MAT2004	Mathematics -3 -Probability & Statistics	3-0-0 (3)	Major Core	
CSD2001	Data Structures	3-0-1 (4)	Major Core	CSD1001
ECE2001	Electric Machines & Power Systems	3-0-1 (4)	Major Core	ECE1001
ECE2002	Digital Electronics	3-0-1 (4)	Major Core	ECE1001
ECE2003	Signal Representation and Processing	3-0-1 (4)	Major Core	MAT1004
	CCC-2	(3)		

Semester 4 (23 credits)				
Course Code	**Course Title**	**L:T:P (Credits)**	**Category**	**Prerequisites**
ECE2004	Analog Circuits	3-0-1 (4)	Major Core	ECE1001
ECE2005	Electromagnetic Engineering	3-0-1 (4)	Major Core	PHY1001
ECE2006	Power Electronics and Machine Drives	3-0-1 (4)	Major Core	ECE1001, ECE2001
ECE2007	Principles of Communication Engineering	3-0-1 (4)	Major Core	ECE2003
ECE2008	Semiconductor Devices	3-0-1 (4)	Major Core	
ECE2009	Computer Organization and Design	3-0-0 (3)	Major Core	CSD1001, ECE2002

Semester 5 (24 credits)				
Course Code	**Course Title**	**L:T:P (Credits)**	**Category**	**Prerequisites**
ECE3001	Control Systems	3-0-1 (4)	Major Core	MAT1004
ECE3002	Computer Communication Networks	3-0-1 (4)	Major Core	ECE2007
ECE4801	Embedded Systems Hardware	3-0-1 (4)	Experiential Learning	ECE2002
	Major Elective – 1	3-0-0 (3)		
	CCC-3	3-0-0 (3)	CCC	
	UWE-1	3-0-0 (3)	UWE	
	UWE-2	3-0-0 (3)	UWE	

Semester 6 (23 credits)				
Course Code	**Course Title**	**L:T:P (Credits)**	**Category**	**Prerequisites**
ECE3003	Artificial Intelligence and Machine Learning	3-0-0 (3)	Major Core	
	Major Elective – 2	3-0-0 (3)		
	Major Elective – 3	3-0-0 (3)		
	Major Elective – 4	3-0-0 (3)		
	CCC-4	3-0-0 (3)	CCC	
	UWE-3	(4)	UWE	
	UWE-4	(4)	UWE	

Semester 7 (24 credits)				
Course Code	**Course Title**	**L:T:P (Credits)**	**Category**	**Prerequisites**
	Major Elective – 5	(4)		
	Major Elective – 6	(4)		
	CCC-5	3-0-0 (3)	CCC	
	UWE-5	3-0-0 (3)	UWE	
	CCC/UWE	(4)		
ECE4901	Major Project-1	0-0-6 (6)	Major Core	

Semester 8 (09 credits)				
Course Code	**Course Title**	**L:T:P (Credits)**	**Category**	**Prerequisites**
	CCC/UWE	3-0-0 (3)		
ECE4902	Internship/ Major Project-2*	0-0-6 (6)	Major Core	

*In the 8th semester Internship/Major project-2 (ECE4902), Satisfactory or Unsatisfactory (S/U) grades will be awarded.

Detailed Break up of Category-wise Courses

Experiential Learning Category				
Course code	**Course Title**	**L:T:P (Credits)**	**Semester**	**Prerequisites**
SOE4801	Introduction to Engineering: Ideas to Impact	1-0-1 (2)	1	
SOE4802	Design to Reality: CAD & 3D Printing	0-1-1 (2)	2	
ECE4801	Embedded Systems Hardware	3-0-1 (4)	5	ECE2002
Total		8		

Major Core Category				
Course code	**Course Title**	**L:T:P (Credits)**	**Semester**	**Prerequisites**
CSD1001	Problem Solving Using Programming	3-0-1 (4)	1	
MAT1003	Multivariate Calculus	3-1-0 (4)	1	
PHY1001	Fields, Waves & Quanta	3-1-1 (5)	1	
ECE1001	The Electron's Path: Fundamentals of EEE	2-0-1 (3)	1	
SNS1001	Nature's Code: Chemistry & Biology	2-0-0 (2)	1	
MAT1004	Linear Systems and Transforms	3-1-0 (4)	2	
MED1001	The Matter of Materials	2-0-0 (2)	2	
CED1001	Forces in Action	2-0-1 (3)	2	
ECE1002	Connected Intelligence: Sensors and IoT	2-0-1 (3)	2	
MAT2004	Mathematics -3 Probability & Statistics	3-0-0(3)	3	
CSD2001	Data Structures	3-0-1 (4)	3	
ECE2001	Electric Machines & Power Systems	3-0-1 (4)	3	ECE1001
ECE2002	Digital Electronics	3-0-1 (4)	3	ECE1001
ECE2003	Signal Representation and Processing	3-0-1 (4)	3	MAT1004
ECE2004	Analog Circuits	3-0-1 (4)	4	ECE1001
ECE2005	Electromagnetic Engineering	3-0-1 (4)	4	PHY1001
ECE2006	Power Electronics and Machine Drives	3-0-1 (4)	4	ECE1001, ECE2001
ECE2007	Principles of Communication Engineering	3-0-1 (4)	4	ECE2003
ECE2008	Semiconductor Devices	3-0-1 (4)	4	
ECE2009	Computer Organization and Design	3-0-0 (3)	4	CSD1001, ECE2002
ECE3001	Control Systems	3-0-1(4)	5	MAT1004
ECE3002	Computer Communication Networks	3-0-1(4)	5	ECE2007
ECE3003	Artificial Intelligence and Machine Learning	3-0-0(3)	6	
Total		**83**		

Major Elective category			
Course code	**Course Title**	**L:T:P**	**Prerequisite**
ECE3301	VLSI Design	3-0-1 (4)	ECE2002
ECE3302	Photovoltaic Power Generation	3-0-0 (3)	ECE1001
ECE3303	Microwave Engineering	3-0-0 (3)	ECE2005
ECE3304	Sensor, Measurement, and Actuators	3-0-1 (4)	
ECE3305	Scientific Computing using MATLAB	3-0-0 (3)	
ECE3306	RF and Microwave Circuit Design	3-0-1 (4)	ECE2005
ECE3307	Wireless Communications	3-0-0 (3)	ECE2007
ECE3308	Information Theory and Coding	3-0-0 (3)	MAT2004
ECE3309	Introduction to Robotics	3-0-1 (4)	ECE4801
ECE3310	EV converters and powertrain	3-0-1 (4)	ECE2006
ECE3311	IoT-Architecture, Communication Technology and Applications	2-0-1 (3)	
ECE3312	Power System Analysis	3-0-1 (4)	ECE2001
ECE3313	Digital Communication	3-0-1 (4)	ECE2003
ECE3314	Object Oriented Programming	3-0-0 (3)	CSD1001
ECE3315	Antenna Theory and Wave Propagation	3-0-1 (4)	ECE2005
ECE3316	Special Topics in Microwave Engineering	3-0-0 (3)	ECE2005
ECE3317	Detection and Estimation	3-0-0 (3)	MAT2004
ECE3318	Modern Control Systems	3-1-0 (4)	ECE3001
ECE3319	Wireless Network Security	3-0-0 (3)	ECE3002
ECE3320	Quantum Computing	3-1-0 (4)	MAT1004
ECE3321	Design of CMOS Analog Circuits	3-0-0 (3)	
ECE3322	Power System Protection and Switchgear	3-0-0 (3)	ECE2001
ECE3323	HVDC Transmission	3-0-0 (3)	ECE2001
ECE3324	Satellite Communications	3-0-0 (3)	ECE2007
ECE3325	ASIC Design Flow: RTL to GDS	2-0-1 (3)	ECE2002, ECE3301
ECE3326	IC Tech & packaging	2-0-1 (3)	ECE2008
ECE3327	MEMS Technology & Devices	3-0-0 (3)	ECE2008
ECE3328	Digital Design with FPGAs	3-0-1 (4)	ECE2002
ECE3329	Micro and Nano Sensors	3-0-1 (4)	ECE2008
ECE4201	Probability and Random Processes	3-0-0 (3)	MAT2004
ECE4202	Information Theory	3-1-0 (4)	MAT2004
ECE4203	Digital Control of Power Converter	2-0-1 (3)	ECE2003
ECE4204	Reconfigurable Computing	3-0-0 (3)	ECE2002
ECE4205	Power System Operation and Control	3-0-0 (3)	ECE2001
ECE4206	Foundations of Deep Learning	3-0-0 (3)	ECE3003
ECE4207	Optical Fiber Communication	3-0-1 (4)	
ECE4208	Graph Signal Processing	3-0-1 (4)	
ECE4209	High Voltage Engineering	3-0-0 (3)	
ECE4210	Radar Engineering	3-0-0 (3)	ECE2005, ECE2007
ECE4211	Computational Electromagnetics	3-0-0 (3)	ECE2005
ECE4212	Smart VLSI WBG Devices for Power Circuits	3-0-0 (3)	ECE2008
ECE4213	Advance Electromagnetics Engineering	3-0-0 (3)	ECE2005
ECE4214	Digital VLSI Testing	3-0-0 (3)	
ECE4215	Medical Image Processing	3-0-0 (3)	

Areas of Specializations (Within Department)

The students enrolled in B. Tech. in Electrical and Computer Engineering program would have an option to get specialization/s in the following emerging areas-

1. Modern Energy Systems
2. Wireless Systems Engineering
3. VLSI Design

Minimum Requirement for Specialization:

- CGPA ≥ 5
- The student must complete minimum of 12 credits from the list of elective courses from the chosen specialization tracks.

List of elective courses in specialization track - Modern Energy Systems

Course code	Course Title	L:T:P
ECE3302	Photovoltaic Power Generation	3-0-0 (3)
ECE3304	Sensor, Measurement, and Actuators	3-0-1 (4)
ECE3312	Power System Analysis	3-0-1 (3)
ECE3318	Modern Control Systems	3-1-0 (4)
ECE3322	Power System Protection and Switchgear	3-0-0 (3)
ECE3323	HVDC Transmission	3-0-0 (3)
ECE3329	Micro and Nano Sensors	3-0-1 (4)
ECE4205	Power System Operation and Control	3-0-0 (3)
ECE4209	High Voltage Engineering	3-0-0 (3)
ECE4212	Smart VLSI WBG Devices for Power Circuits	3-0-0 (3)

List of elective courses in specialization track - VLSI Design

Course code	Course Title	L:T:P
ECE3301	VLSI Design	3-0-1 (4)
ECE3321	Design of Analog CMOS Circuits	3-0-0 (3)
ECE3325	ASIC Design Flow: RTL to GDS	2-0-1 (3)
ECE3326	IC Tech & packaging	3-0-0 (3)
ECE3327	MEMS Technology & Devices	3-0-0 (3)
ECE3329	Micro and Nano Sensors	3-0-1 (4)
ECE3328	Digital Design with FPGAs	3-0-1 (4)
ECE4204	Reconfigurable Computing	3-0-0 (3)
ECE4212	Smart VLSI WBG Devices for Power Circuits	3-0-0 (3)

List of elective courses in specialization track - Wireless Systems Engineering

Course code	Course Title	L:T:P
ECE3303	Microwave Engineering	3-0-0 (3)
ECE3306	RF and Microwave Circuit Design	3-0-1 (4)
ECE3307	Wireless Communications	3-0-0 (3)
ECE3308	Information Theory and Coding	3-0-0 (3)
ECE3313	Digital Communication	3-0-1 (4)
ECE3315	Antenna Theory and Wave Propagation	3-0-1 (4)
ECE3316	Special Topics in Microwave Engineering	3-0-0 (3)
ECE3319	Wireless Network Security	3-0-0 (3)
ECE3324	Satellite Communications	3-0-0 (3)
ECE4202	Information Theory	3-1-0 (4)
ECE4207	Optical Fiber Communication	3-0-1 (4)
ECE4208	Graph Signal Processing	3-0-1 (4)
ECE4210	Radar Engineering	3-0-0 (3)
ECE4211	Computational Electromagnetics	3-0-0 (3)
ECE4213	Advance Electromagnetics Engineering	3-0-0 (3)

Areas of Interdisciplinary Specialization

The students enrolled in B. Tech. in Electrical and Computer Engineering program would have an option to specialize in one of the following interdisciplinary areas-

1. Applied Machine Intelligence
2. E-Mobility
3. Cognitive Robotics
4. Real-Time Embedded Systems

Minimum Requirement for Specialization:

- CGPA ≥ 5
- The student must complete minimum of 12 credits from the list of elective courses from the chosen specialization bucket.

List of elective courses in specialization track – Applied Machine Intelligence

Prerequisites – Fundamental knowledge of the following two topics:

- Probability and Statistics (Axioms of probability, conditional probability and independence, Bayes theorem, Random variables, basics of information theory, correlation, regression) and
- Machine Learning (ECE3003/CSD4002 or equivalent courses)

Course code	Course Title	Compulsory	Offering Department
ECE4206/ CSD4210	Deep Learning	Yes	EED/CSE/ SWAYAM
ECE3320	Quantum Computing	No	EED
ECE4215	Medical Image Processing	No	EED
CSD4211	Image Processing and Its Applications	No	CSE
CSD4228	Reinforcement Learning	No	CSE
MED4204	Robotics	No	MED
More relevant courses may be added by other SoE departments			

List of elective courses in specialization track – E-Mobility

- **Prerequisites -** Power Electronics & Machine Drives (ECE2006) (Core of ECE and UWE for Others)/ equivalent course (SWAYAM)

Course code	Course Title	Compulsory	Offering Department
ECE3310	EV converters and powertrain	Yes	EED
CSD4236	Connected Car Technology	Yes	CSE
MED3306	Electric Vehicle Technology	Yes	MED
ECE4203	Digital Control of Power Converter	No	EED
CSD4209	Computer Vision	No	CSE
MED4205	Energy Storage and Conversion Devices for Electric Vehicles	No	MED

List of elective courses in specialization track - Cognitive Robotics

- **Prerequisites –**Control Systems (ECE3001), Knowledge of Embedded Systems

Course code	Course Title	Compulsory (Yes/No)	Offering Department
MED4204	Robotics	Yes	MED
MED3305	Soft Robotics	No	MED
MED3311	Industrial Automation	No	MED
CSD4209	Computer Vision	No	CSE
ECE3318	Modern Control Systems	No	EED
ECE3311 /CSD4220	Internet of Things	No	EED/CSE
ECE4206 / CSD4210	Deep Learning	No	EED/CSE

List of elective courses in specialization track – Real-Time Embedded Systems

- **Prerequisites –** Linear System and Transform (MAT1004), Embedded System Hardware (ECE4801)

Course code	Course Title	Compulsory	Offering Department
ECE3328	Digital Design with FPGAs	No	EED
ECE4204	Reconfigurable Computing	No	EED
ECE4208	Graph Signal Processing	No	EED
CSD4227	Real Time Systems	No	CSE
CSD4212	Distributed Systems	No	CSE
CSD4206	Cloud Computing	No	CSE