B. Tech. Honors/ Research Degree
in
Electronics Engineering (VLSI Design and Technology)

B.Tech in Electronics Engineering (VLSI Design and Technology) Program Educational Objectives (PEOs):

1. Lead a successful career in industries or undertake entrepreneurial endeavors and provide solutions in the areas of designing and developing VLSI circuits and systems, utilizing industry-standard tools and methodologies.
2. Utilize their knowledge, skills and resources to design, invent and find creative and innovative solutions to engineering problems in a multidisciplinary work environment following appropriate ethical practices.
3. Develop attitude in lifelong learning, apply and adapt new ideas as the technology evolves.

Program Outcomes (POs):

The program outcomes are:

a) **Engineering knowledge:** Ability to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b) **Problem analysis:** Ability to identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c) **Design/Development of solutions:** Ability to design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d) **Conduct investigations on complex problems:** Ability to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e) **Modern tool usage:** Ability to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

f) **The engineer and society:** Ability to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g) **Environment and sustainability:** Ability to understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

h) **Ethics:** Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i) **Individual and team:** Ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j) **Communication:** Ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and

write effective reports and design documentation, make effective presentations, and give and receiveclear instructions.

k) **Project management and finance:** Ability to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l) **Life-long learning:** Ability to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

The program specific outcomes are:

a) Proficiency to design, simulate, and analyze VLSI circuits and systems using industry-standard tools and techniques, demonstrating a deep understanding of VLSI design principles, methodologies, and emerging technologies.

b) Ability to carry out research in the fields of SoC Design, microfabrication and related technologies.

c) Ability to design and develop complex products using suitable tools for societal and engineering needs with skills to communicate effectively in groups.

CURRICULUM

The total minimum credits required for completing the B.Tech in Electronics Engineering (VLSI Design and Technology)Program is 160

PROFESSIONAL ELECTIVE COURSES

Professional elective-I, II, III are offered during semester five and six. Professional elective IV and V are offered during semester seven and eight. List of electives to be offered during an academic year is announced at the beginning of respective semesters. An elective will be offered only if ten or more students are interested in it. Not that all the electives will be offered in every academic year. Some electives may have seat limitations and will be offered in first cum first serve basis. In order to accommodate more aspiring students, electives having high demand may be offered twice, that is during autumn as elective-I or II and again as elective-III during spring semester.

Students can select electives based on their interest in a domain. Areas of specialization or domain are optional, however electives can be grouped to provide learning around a functional area. Students may qualify for a maximum of one area of Specialization. Completion of the specialization will not be reflecting on transcripts or degree certificate.

Electronics Engineering (VLSI Design and Technology)

SEMESTER III

Theory							
Sl No.	Course Code	Subjects	L	T	P	Total	Credit
1	EV21001	Analog and Digital Electronic Circuit	3	1	0	4	4
2	EC20001	Signals and Systems	3	0	0	3	3
3	EV20001	Microfabrication	3	0	0	3	3
4	CS20001	Concepts of Data Structures and Algorithms	3	0	0	3	3
5	MA21001	Probability and Statistics	3	1	0	4	4
6	EX20003	Scientific and Technical writing	2	0	0	2	2
Total Credit (Theory subjects)						19	19
Practical							
1	EC29001	Electronic Circuits Lab	0	0	4	4	2
2	CS29001	Data Structures Lab	0	0	2	2	1
Sessional							
1		Vocational Elective	0	0	2	2	1
Total Credit (Practical & Sessional subject)						8	4
Total Credit (Semester)						27	23

SEMESTER IV

Theory							
Sl No.	Course Code	Subjects	L	T	P	Total	Credit
1	MA21002	Discrete Mathematics	3	1	0	4	4
2	EV20002	Digital VLSI Circuits	3	0	0	3	3
3	EV20004	Digital Logic Design with Verilog	3	0	0	3	3
4	EV20006	Embedded Design and Computer Architecture	3	0	0	3	3
5	EX20001	Industry 4.0 Technologies	2	0	0	2	2
6		HASS Elective-II	3	0	0	3	3
Total Credit (Theory subjects)						18	18
Practical							
1	EV29002	Digital VLSI Lab	0	0	2	2	1
2	EV29004	Verilog Lab	0	0	2	2	1
3	EV29006	Scripting Language and Python	0	0	2	2	1
Sessional							
1							
Total Credit (Practical & Sessional subject)						6	3
Total Credit (Semester)						24	21

SEMESTER V

Theory							
Sl No.	Course Code	Subjects	L	T	P	Total	Credit
1	EC20008	Communication Engineering	3	0	0	3	3
2	EV30001	Analog IC Design	3	0	0	3	3
3	HS30401	Universal Human Values	3	0	0	3	3
4		Professional Elective-I	3	0	0	3	3
5		Professional Elective-II	3	0	0	3	3
6		HASS Elective-III	3	0	0	3	3
Total Credit (Theory subjects)						18	18
Practical							
1	EV39001	Analog IC Design Lab	0	0	2	2	1
2	EV39003	Embedded System Lab	0	0	2	2	1
Sessional							
1	SAxxxx	K-Explore Open Elective-I	0	0	2	2	1
2	EC38001	Electronics Product Development	0	0	2	2	1
Total Credit (Practical & Sessional subject)						8	4
Total Credit (Semester)						26	22

SEMESTER VI

Theory							
Sl No.	Course Code	Subjects	L	T	P	Total	Credit
1	EV30002	VLSI for Signal Processing	3	0	0	3	3
2	EV30004	SoC Design	3	0	0	3	3
3	EV30006	VLSI Verification and Testing	3	0	0	3	3
4	HS30101	Engineering Economics	3	0	0	3	3
5		Professional Elective-III	3	0	0	3	3
6		Open Elective-II / (MI – I)	3	0	0	3	3
Total Credit (Theory subjects)						18	18
Practical							
1	EV39002	SoC Design Lab	0	0	2	2	1
2	EV39004	VLSI Testing and Verification Lab	0	0	2	2	1
	EV39006	VLSI Signal Processing Lab	0	0	2	2	1
Sessional							
1	EV37002	Minor Project	-	-	-	-	2
Total Credit (Practical & Sessional subject)						8	5
Total Credit (Semester)						26	23

SEMESTER VII (for B. Tech. (Hons.))

Theory							
Sl No.	Course Code	Subjects	L	T	P	Total	Credit
1	EX40003	Engineering Professional Practice	2	0	0	2	2
2		Professional Elective-IV	3	0	0	3	3
3		Open Elective-III / (MI – II)	3	0	0	3	3
4		MI – III (Optional)	3	0	0	3	3
5		MI – IV (Optional)	3	0	0	3	3
Total Credit (Theory subjects)							8
Sessional							
1	EV47001	Project-I / Internship	-	-	-	-	5
2	EV48001	Practical Training	-	-	-	-	2
3		MI-Lab / MI Project (Optional)					2
Total Credit (Practical & Sessional subject)							7
Total Credit (Semester)							15

SEMESTER VIII (for B. Tech. (Hons.))

Theory							
Sl No.	Course Code	Subjects	L	T	P	Total	Credit
1		Professional Elective-V	3	0	0	3	3
2		Open Elective-IV / (MI – V)	3	0	0	3	3
3		MI – VI (Optional)	3	0	0	3	3
Total Credit (Theory subjects)							6
Sessional							
1	EV47002	Project-II	-	-	-	-	9
Total Credit (Practical & Sessional subject)							9
Total Credit (Semester)							15

SEMESTER VII (for B. Tech. (Research.))

Theory							
Sl No.	Course Code	Subjects	L	T	P	Total	Credit
1	EX40001	Research Methods and Ethics	3	0	0	3	3
2	EX40003	Engineering Professional Practice	2	0	0	2	2
3		Research Elective-I	3	0	0	3	3
4		MI-II (Optional)	3	0	0	3	3
5		MI – III (Optional)	3	0	0	3	3
6		MI – IV (Optional)	3	0	0	3	3
Total Credit (Theory subjects)							8
Sessional							
1	EV47001	Project-I / Internship	-	-	-	-	5
2	EV48001	Practical Training	-	-	-	-	2
3		MI-Lab / MI Project (Optional)					2
Total Credit (Practical & Sessional subject)							7
Total Credit (Semester)							15

SEMESTER VIII (for B. Tech. (Research.))

Theory							
Sl No.	Course Code	Subjects	L	T	P	Total	Credit
1		Professional Elective-V	3	0	0	3	3
2		MI-V (Optional)	3	0	0	3	3
3		MI – VI (Optional)	3	0	0	3	3
Total Credit (Theory subjects)							3
Sessional							
1	EV47004	Project-II					12
Total Credit (Practical & Sessional subject)							12
Total Credit (Semester)							15

PROFESSIONAL ELECTIVES – I/II/III

Sl. No	Course Code	Course Title	L	T	P	Total	Credits
1.	CS20002	Operating Systems	3	0	0	3	3
2.	CS20006	Database Management Systems	3	0	0	3	3
3.	CS30010	Cloud Computing	3	0	0	3	3
4.	CS30011	Computational Intelligence	3	0	0	3	3
5.	CS30019	Web Technology and Applications	3	0	0	3	3
6.	CS30029	Computer Vision and Pattern Recognition	3	0	0	3	3
7.	EC30007	ARM and Advanced Processors	3	0	0	3	3
8.	EC30008	Wireless Sensor Networks	3	0	0	3	3
9.	EC30009	Compound Semiconductor Basics	3	0	0	3	3
10..	EC30010	Mobile Ad Hoc Network	3	0	0	3	3
11.	EC30012	Nanoelectronics	3	0	0	3	3
12.	EC30013	Optical and Satellite Communication	3	0	0	3	3
13.	EC30015	Hardware and Software Co-Design of Embedded System	3	0	0	3	3
14.	EC30017	Audio and Speech Processing	3	0	0	3	3
15.	EC30019	Information Theory and Coding	3	0	0	3	3
16.	EC30021	Industrial IoT	3	0	0	3	3
17.	EE30012	Sensors & Actuators	3	0	0	3	3
18.	EE30022	Special Machines & Control	3	0	0	3	3
19.	EE30038	Introduction to Electrical Machines	3	0	0	3	3
20.	EE30047	Power Electronics Circuits	3	0	0	3	3
21.	EL30001	Industrial Automation	3	0	0	3	3
22.	EM30007	Machine Learning based Signal Processing	3	0	0	3	3
23.	EM30008	Deep Learning: Algorithms and Implementation	3	0	0	3	3
24.	EM30009	Data Analytics	3	0	0	3	3
25.	EM30011	Data Mining	3	0	0	3	3
26.	EV30003	Semiconductor Optoelectronics	3	0	0	3	3
27.	EV30005	Semiconductor Material Synthesis and Characterization	3	0	0	3	3
28.	EV30008	Mixed Signal IC Design	3	0	0	3	3
29.	EV30010	CAD for VLSI	3	0	0	3	3

PROFESSIONAL ELECTIVE –IV/ V

Sl. No	Course Code	Course Title	L	T	P	Total	Credits
1.	CS30023	Software Defined Networking	3	0	0	3	3
2.	CS40010	Augmented and Virtual Reality	3	0	0	3	3
3.	CS40015	Cryptography and Network Security	3	0	0	3	3
4.	EC40001	Optimization Techniques in Engineering	3	0	0	3	3
5.	EC40002	Millimetre Waves and Terahertz Technology	3	0	0	3	3
6.	EC40003	Cognitive Radio and Cooperative Communication	3	0	0	3	3
7.	EC40004	Quantum Communication	3	0	0	3	3
8.	EC40006	Advanced VLSI and SoC	3	0	0	3	3
9.	EC40007	Low Power VLSI Design	3	0	0	3	3
10.	EC40008	Advanced Computer Architecture and RISC-V Processor Design	3	0	0	3	3
11.	EC40009	Biomedical Signal Processing	3	0	0	3	3
12.	EE30024	Electric Drives and Control	3	0	0	3	3
13.	EE40010	Electric Vehicles Technology	3	0	0	3	3
14.	EL40001	Process Control & Robotics	3	0	0	3	3
15.	EL40003	Advanced Control System	3	0	0	3	3
16.	EM40001	ML for Language Processing	3	0	0	3	3
17.	EM40006	Cybersecurity	3	0	0	3	3
18.	EM40008	Bioinformatics	3	0	0	3	3
19.	EM40010	Optimization Methods in Machine Learning	3	0	0	3	3
20.	EV40001	High Speed Interface Design	3	0	0	3	3

RESEARCH ELECTIVE - I (OFFERED BY SCHOOL OF ELECTRONICS ENGINEERING)

Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1.	EC30009	Compound Semiconductor Basics	3	0	0	3	3
2.	EC40007	Low Power VLSI Design	3	0	0	3	3
3.	CS30023	Software Defined Networking	3	0	0	3	3
4.	EC40015	5G Supportive Technologies	3	0	0	3	3
5.	EC40017	Planner Antenna	3	0	0	3	3
6.	EC40019	Solar Cell Device and Material Technology	3	0	0	3	3

RESEARCH ELECTIVE – II (OFFERED BY SCHOOL OF ELECTRONICS ENGINEERING)

Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1.	EC40003	Cognitive Radio and Cooperative Communication	3	0	0	3	3
2.	EC40006	Advanced VLSI and SoC	3	0	0	3	3
3.	EC40010	Massive MIMO Technology	3	0	0	3	3
4.	EC40014	RF CMOS VLSI	3	0	0	3	3
5.	EC40016	VLSI Signal Processing	3	0	0	3	3
6.	EC40018	Smart Antennas	3	0	0	3	3

VOCATIONAL ELECTIVES

Vocational courses offered by School of Civil Engineering

Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1.	CE28001	Building Drawing, Estimation & Costing (for Civil Engineering Students)	0	0	2	1	1
2.	CE28003	GIS & GPS Applications (For other branch students)	0	0	2	1	1

Vocational courses offered by School of Computer Science Engineering

Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1.	CS28001	Web Design	0	0	2	1	1

Vocational courses offered by School of Electrical Engineering

Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1.	EE28011	Industrial wiring and control panel design	0	0	2	1	1
2.	EE28013	Installation, operation and maintenance of solar power system	0	0	2	1	1
3.	EE28015	Domestic wiring and home automation	0	0	2	1	1
4.	EE28017	Cyber physics application in industrial IOT	0	0	2	1	1
5.	EE28019	Industrial Control and Remote Monitoring	0	0	2	1	1

Vocational courses offered by School of Electronics Engineering

Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1.	EC28001	Computational Photography	0	0	2	1	1
2.	EC28003	Sound Engineering	0	0	2	1	1
3.	EC28005	Sensors for Automation	0	0	2	1	1
4.	EC28007	PCB Design	0	0	2	1	1

Vocational courses offered by School of Mechanical Engineering

Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1	ME28011	Additive Manufacturing(3-D Printing)	0	0	2	1	1
2	ME28013	Die development by CNC milling	0	0	2	1	1
3	ME28015	Concept Car Manufacturing	0	0	2	1	1
4	ME28017	Development of Autonomous Wheeled	0	0	2	1	1
5	ME28019	Modelling of Micro-Wind turbine by 3D	0	0	2	1	1

K-EXPLORE OPEN ELECTIVE - I

Sl. No.	Course Code	Subjects	L	T	P	Total	Credit
1.	SA38001	Robotics	0	0	2	2	1
2.	SA38003	Web Designing	0	0	2	2	1
3.	SA38005	Civil-Tech	0	0	2	2	1
4.	SA38007	Circuit Design & Control	0	0	2	2	1
5.	SA38009	Indian Classical, Folk & Bollywood Dance	0	0	2	2	1
6.	SA38011	Indian Classical & Western Music	0	0	2	2	1
7.	SA38013	Graphic Designing & Editing	0	0	2	2	1
8.	SA38015	Art & Craft	0	0	2	2	1
9.	SA38017	Theatre & Street Play	0	0	2	2	1
10.	SA38019	Film Making	0	0	2	2	1
11.	SA38021	Debating,Public Speaking& Anchoring	0	0	2	2	1
12.	SA38023	Creative Writing	0	0	2	2	1
13.	SA38025	Photography & Videography	0	0	2	2	1
14.	SA 38027	Fashion Styling	0	0	2	2	1
15.	SA 38029	Culinary Arts	0	0	2	2	1
16.	SA 38031	Quiz Activity	0	0	2	2	1
17.	SA 38033	Social Outreach	0	0	2	2	1
18.	SA 38035	Health & Emergency Care	0	0	2	2	1