B. Tech. Honors/ Research Degree
in
Electronics and Telecommunication Engineering

B. Tech in Electronics and Telecommunication Engineering Program Educational Objectives (PEOs):

1. Lead a successful career in industries or undertake entrepreneurial endeavors and provide solutions in the areas of electronic system design, communication & networking and allied areas of Electronics and Telecommunication engineering or pursue advanced studies.
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 receive clear 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) Ability to design, and comprehend electronics sub-systems using the knowledge of electronic circuits, signal processing, communication engineering, networking and embedded technology.

b) Ability to carry out research in the fields of VLSI, advanced communication 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. programme in Electronics and Telecommunication Engineering is 162

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 and Telecommunication Engineering

SEMESTER III

Theory							
Sl.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	MA21001	Probability and Statistics	3	1	0	4	4
2.	EC20001	Signals and Systems	3	0	0	3	3
3.	EC20003	Electromagnetic Theory and Antennas	3	0	0	3	3
4.	EC20007	Semiconductor Technology	3	0	0	3	3
5.	EC21001	Electronic Circuits	3	1	0	4	4
6.	EX20003	Scientific and Technical Writing	2	0	0	2	2
Total Credit (Theory Subjects)			**17**	**2**	**0**	**19**	**19**
Practical							
1.	EC29001	Electronic Circuits Lab	0	0	4	4	2
2.	EC29003	Signal Processing Lab	0	0	2	2	1
Sessional							
1.		Vocational Elective	0	0	2	2	1
Total Credit (Practical and Sessional Subjects)			**0**	**0**	**8**	**8**	**4**
Grand Total						**27**	**23**

SEMESTER IV

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	MA21006	Vectors, Differential Equations and Complex Analysis	3	1	0	4	4
2.	EC20002	Microprocessors and Embedded Systems	3	0	0	3	3
3.	EC21002	Communication Systems and Techniques	3	1	0	4	4
4.	CS20001	Concepts of Data Structures and Algorithms	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)			**17**	**2**	**0**	**19**	**19**
Practical							
1.	EC29002	Communication Engineering Lab	0	0	2	2	1
2.	EC29006	Microprocessors and Embedded System Lab	0	0	2	2	1
3.	CS29001	Data Structures Lab	0	0	2	2	1
Total Credit (Practical Subjects)			**0**	**0**	**6**	**6**	**3**
Grant Total						**25**	**22**

SEMESTER V

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	EC30001	Microwave Engineering	3	0	0	3	3
2.	EC30003	Linear and Digital Control System	3	0	0	3	3
3.	HS30401	Universal Human Values	3	0	0	3	3
4.		HASS Elective-III	3	0	0	3	3
5.		Professional Elective-I	3	0	0	3	3
6.		Professional Elective-II	3	0	0	3	3
Total Credit (Theory Subjects)			**18**	**0**	**0**	**18**	**18**
Practical							
1.	EC39003	Microwave Engineering Lab	0	0	2	2	1
2.	EC39005	Control Systems Lab	0	0	2	2	1
Sessional							
1.	EC38001	Electronics Product Development	0	0	2	2	1
2.	SAxxxxx	K-Explore Open Elective-I	0	0	2	2	1
Total Credit (Practical and Sessional Subjects)			**0**	**0**	**8**	**8**	**4**
Total						**26**	**22**

SEMESTER VI

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	EC30002	Wireless Mobile Communication	3	0	0	3	3
2.	EC30004	Data Communication and Networking	3	0	0	3	3
3.	EC30005	VLSI Circuits and Systems	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**	**0**	**0**	**18**	**18**
Practical							
1.	EC39006	VLSI Design Lab	0	0	2	2	1
2.	EC39002	Wireless Communication and Networking Lab	0	0	2	2	1
3.	EC39004	Electronics Design Lab	0	0	4	4	2
Sessional							
1.	EC37002	Minor Project	-	-	-	-	2
Total Credit (Practical and Sessional Subjects)							**6**
Total						**26**	**24**

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

Theory							
Sl. No	**Course Code**	**Course Title**	**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 of Theory						**8**	**8**
Sessional							
1.	EC47001	Project- I / Internship	-	-	-	-	5
2.	EC48001	Practical Training/ Internship	-	-	-	-	2
3		MI-Lab / MI Project (optional)	-	-	-	-	2
Total						**8**	**15**

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

Theory							
Sl. No	**Course Code**	**Course Title**	**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 of Theory						**6**	**6**
Sessional							
1.	EC47002	Project- II	-	-	-	-	9
Total						**6**	**15**

SEMESTER VII (B.Tech. (Research))

Theory							
Sl. No	**Course Code**	**Course Title**	**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 of Theory						**8**	**8**
Sessional							
1.	EC47001	Project- I / Internship	-	-	-	-	5
2.	EC48001	Practical Training	-	-	-	-	2
3		MI-Lab / MI Project (optional)	-	-	-	-	2
Total						**8**	**15**

SEMESTER VIII (B.Tech.(Research)

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.		Research Elective-II	3	0	0	3	3
2.		MI-V (Optional)	3	0	0	3	3
3		MI – VI (optional)	3	0	0	3	3
Total of Theory						**3**	**3**
Sessional							
1.	EC47004	Project- II	-	-	-	-	12
Total						**3**	**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.	EC30006	Hardware Description Language for Digital Design	3	0	0	3	3
8.	EC30007	ARM and Advanced Processors	3	0	0	3	3
9.	EC30008	Wireless Sensor Networks	3	0	0	3	3
10..	EC30009	Compound Semiconductor Basics	3	0	0	3	3
11.	EC30010	Mobile Ad Hoc Network	3	0	0	3	3
12.	EC30011	Digital System Design with Verilog	3	0	0	3	3
13.	EC30012	Nanoelectronics	3	0	0	3	3
14.	EC30013	Optical and Satellite Communication	3	0	0	3	3
15.	EC30015	Hardware and Software Co-Design of Embedded System	3	0	0	3	3
16.	EC30017	Audio and Speech Processing	3	0	0	3	3
17.	EC30019	Information Theory and Coding	3	0	0	3	3
18.	EC30021	Industrial IoT	3	0	0	3	3
19.	EE30012	Sensors & Actuators	3	0	0	3	3
20.	EE30022	Special Machines & Control	3	0	0	3	3
21.	EE30038	Introduction to Electrical Machines	3	0	0	3	3
22.	EE30047	Power Electronics Circuits	3	0	0	3	3
23.	EL30001	Industrial Automation	3	0	0	3	3
24.	EM30007	Machine Learning based Signal Processing	3	0	0	3	3
25.	EM30008	Deep Learning: Algorithms and Implementation	3	0	0	3	3
26.	EM30009	Data Analytics	3	0	0	3	3
27.	EM30011	Data Mining	3	0	0	3	3
PROFESSIONAL ELECTIVE –IV/ V							
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.	EC40005	Analog and Mixed Signal IC Design	3	0	0	3	3
9.	EC40006	Advanced VLSI and SoC	3	0	0	3	3
10.	EC40007	Low Power VLSI Design	3	0	0	3	3
11.	EC40008	Advanced Computer Architecture and RISC-V Processor Design	3	0	0	3	3
12.	EC40009	Biomedical Signal Processing	3	0	0	3	3
13.	EE30024	Electric Drives and Control	3	0	0	3	3
14.	EE40010	Electric Vehicles Technology	3	0	0	3	3
15.	EL40001	Process Control & Robotics	3	0	0	3	3

16.	EL40003	Advanced Control System	3	0	0	3	3
17.	EM40001	ML for Language Processing	3	0	0	3	3
18.	EM40006	Cybersecurity	3	0	0	3	3
19.	EM40008	Bioinformatics	3	0	0	3	3
20.	EM40010	Optimization Methods in Machine Learning	3	0	0	3	3

Elective Baskets (Specialization)

PE I	PE II	PE III	PE IV	PE V	Specialization
CS20002	CS20006 / CS30019	EM30009 / EM30011 / CS30010	CS30023 / CS40015	EM40006 / CS40010	**Computer Engineering**
EC30019	EC30013	EC30010 / EC30008	EC40003 / CS40015	EC40004 / EC40002	**Communication & Networking**
EC30009 / EC30007	EC30011 / EC30006	EC30015	EC40005 / EC40007	EC40006 / EC40008	**VLSI & Embedded Design**
CS30011 / EM30007	CS30029 / EC30017	EM30008 / EM30009 / EM30011	EC40009 / EM40010	EM40001 / EM40008	**Machine Learning and Applications**
EE30038 / EC30021	EE30047 / EE30012	EE30022 / EL30001	EE30024 / EL40003	EL40001 / EE40010	**Automation**

B. Tech. Honors/ Research Degree
in
Electronics and Electrical Engineering

B. Tech in Electronics and Electrical Engineering Program Educational Objectives (PEOs):

The B. Tech Program in Electronics and Electrical Engineering aims to prepare the graduates with the following objectives:

1. Lead a successful career in industries or undertake entrepreneurial endeavors and provide solutions in the areas of electronic system design for power system, power electronic drives and allied areas of Electronics and Electrical engineering or pursue advanced studies.
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.
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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 engineeringproblems.

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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) Ability to design, and implement electrical and electronic circuits, electrical drives and power system control for industrial applications.

b) Ability to conduct research in automation & control, embedded system 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. programme in Electronics and Electrical Engineering is 162

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.

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Electronics and Electrical Engineering

SEMESTER III

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	MA21001	Probability and Statistics	3	1	0	4	4
2.	EC20001	Signals and Systems	3	0	0	3	3
3.	EC21001	Electronic Circuits	3	1	0	4	4
4.	EE20001	Network Theory	3	0	0	3	3
5.	CS20001	Concepts of Data Structures and Algorithms	3	0	0	3	3
6.	EX20003	Scientific and Technical Writing	2	0	0	2	2
Total of Theory						**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 Electives	0	0	2	2	1
Total Credit (Practical and Sessional Subjects)			**0**	**0**	**8**	**8**	**4**
Semester Total						**27**	**23**

SEMESTER IV

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	MA21006	Vectors, Differential Equations and Complex Analysis	3	1	0	4	4
2.	EC20003	Electromagnetic Theory and Antennas	3	0	0	3	3
3.	EE20010	Electrical Machines	3	0	0	3	3
4.	EL20002	Instrumentation and Control Systems	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 of Theory						**18**	**18**
Practical							
1.	EC29003	Signal Processing Lab	0	0	2	2	1
2.	EE29002	Electrical Machines Laboratory	0	0	2	2	1
3.	EL29002	Instrumentation and Control System Lab	0	0	2	2	1
Total of Practical						**6**	**3**
Semester Total						**24**	**21**

SEMESTER V

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	EC20002	Microprocessors and Embedded Systems	3	0	0	3	3
2	EE30007	Power Transmission and Distribution	3	0	0	3	3
3.	HS30401	Universal Human Values	3	0	0	3	3
4.		HASS Elective III	3	0	0	3	3
5.		Professional Elective – I	3	0	0	3	3
6.		Professional Elective – II	3	0	0	3	3
Total of Theory						**18**	**18**
Practical							
1.	EC29006	Microprocessors and Embedded System Lab	0	0	2	2	1
2.	EE39007	Programmable Logic Control Lab	0	0	2	2	1
Sessional							
1.	EC38001	Electronics Product Development	0	0	2	2	1
2	EE28002	Electrical System Modeling using MATLAB	0	0	2	2	1
3.	SAxxxxx	K-Explore Open Elective – I	0	0	2	2	1
Total Credit (Practical and Sessional Subjects)						**10**	**5**
Semester Total						**28**	**23**

SEMESTER VI

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	EC20008	Communication Engineering	3	0	0	3	3
2.	EE30005	Power Electronics and Drives	3	0	0	3	3
3.	EE30006	Power System Operation and Control	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 of Theory						**18**	**18**
Practical							
1.	EC39004	Electronics Design Lab	0	0	4	4	2
2.	EE39001	Power Electronics Lab	0	0	2	2	1
3.	EE39002	Power Systems Lab	0	0	2	2	1
Sessional							
1.	EL37002	Minor Project	-	-	-	-	2
Total Credit (Practical and Sessional Subjects)						**8**	**6**
Semester Total						**26**	**24**

SEMESTER VII (B.Tech (Hons))

Theory							
Sl. No		**Course Title**	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 of Theory						**8**	**8**
Practical							
1.	EL47001	Project – I/Internship	-	-	-	-	5
2.	EL48001	Practical Training	-	-	-	-	2
3.		MI-Lab / MI Project (optional)	-	-	-	-	2
Total of Practical							**7**
Semester Total						**8**	**15**

SEMESTER VIII (B.Tech (Hons))

Theory							
Sl. No	Course Code	**Course Title**	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 of Theory						**6**	**6**
Sessional							
1.	EL47002	Project- II	-	-	-	-	9
Total of Sessional						**-**	**9**
Semester Total						**6**	**15**

SEMESTER VII (B.Tech (Research))

Theory							
Sl. No	**Course Code**	**Course Title**	**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 of Theory						**8**	**8**
Sessional							
1.	EL47001	Project- I	-	-	-	-	5
2.	EL48001	Practical Training	-	-	-	-	2
3.		MI-Lab/ MI-Project (Optional)	-	-	-	-	2
Total of Sessional						**-**	**7**
Total						**8**	**15**

SEMESTER VIII (B.Tech (Research))

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.		Research Elective-II	3	0	0	3	3
2.		MI-V (Optional)	3	0	0	3	3
		MI-VI(Optional)	3	0	0	3	3
Total of Theory						**3**	**3**
Sessional							
1.	EL47004	Project- II	-	-	-	-	12
Total of Sessional							**12**
Total						**3**	**15**

PROFESSIONAL ELECTIVES – I/II/III

Sl. No	Course Code	Course Title	L	T	P	Total	Credits
1.	CS20006	Database Management Systems	3	0	0	3	3
2.	CS30011	Computational Intelligence	3	0	0	3	3
3.	CS30029	Computer Vision and Pattern Recognition	3	0	0	3	3
4.	EC30004	Data Communication and Networking	3	0	0	3	3
5.	EC30007	ARM and Advanced Processor	3	0	0	3	3
6.	EC30011	Digital System Design with Verilog	3	0	0	3	3
7.	EC30013	Optical & Satellite Communication	3	0	0	3	3
8.	EC30015	Hardware and Software Co-Design of Embedded System	3	0	0	3	3
9.	EC30019	Information Theory & Coding	3	0	0	3	3
10	EC30021	Industrial IoT	3	0	0	3	3
11.	EE30012	Sensors and Actuators	3	0	0	3	3
12.	EE30013	Industrial Applications of Electric Energy	3	0	0	3	3
13.	EE30014	Power Generation and Control	3	0	0	3	3
14.	EE30015	IoT for Electrical Engineering	3	0	0	3	3
15.	EE30016	Renewable Energy Resource	3	0	0	3	3
16.	EE30020	Energy Audit and Accounting	3	0	0	3	3
17.	EE30024	Electric Drives and Control	3	0	0	3	3
18.	EE30045	Switch Gear and Protecting Devices	3	0	0	3	3
19.	EE30047	Power Electronics Circuits	3	0	0	3	3
20.	EL30001	Industrial Automation	3	0	0	3	3
21.	EM30007	Machine Learning Based Signal Processing	3	0	0	3	3
22.	EM30008	Deep Learning: Algorithms & Implementation	3	0	0	3	3

PROFESSIONAL ELECTIVE IV/V

Sl. No	Course Code	Course Title	L	T	P	Total	Credits
1.	CS40015	Cryptography and Network Security	3	0	0	3	3
2.	EC30008	Wireless Sensor Network	3	0	0	3	3
3.	EC40001	Optimization Techniques in Engineering	3	0	0	3	3
4.	EC40004	Quantum Communication	3	0	0	3	3
5.	EC40005	Analog and Mixed Signal IC Design	3	0	0	3	3
6.	EC40006	Advanced VLSI and SoC	3	0	0	3	3
7.	EC40007	Low Power VLSI Design	3	0	0	3	3
8.	EC40008	Advanced Computer Architecture and RISC-V Processor Design	3	0	0	3	3
9.	EC40009	Biomedical Signal Processing	3	0	0	3	3
10.	EE40010	Electric Vehicles Technology	3	0	0	3	3
11.	EE40012	Smart Grid	3	0	0	3	3
12.	EE40013	Wind and Biomass Energy	3	0	0	3	3
13.	EE40014	Energy Management and SCADA	3	0	0	3	3
14.	EE40017	Tidal and Small Hydro Power	3	0	0	3	3
15.	EL40001	Process Control and Robotics	3	0	0	3	3
16.	EL40003	Advanced Control System	3	0	0	3	3
17.	EM40006	Cybersecurity	3	0	0	3	3
18.	EM40010	Optimization Methods in Machine Learning	3	0	0	3	3

Elective Baskets (Specializations)

PE I	PE II	PE III	PE IV	PE V	Specialization
EC30019	EC30013	EC30004	EC30008	EC40004	Communication & Networking
EC30007	EC30011	EC30015	EC40005 / EC40007	EC40006 EC40008	VLSI and Embedded system
CS20006/ CS30011	EM30007/ CS30029	EM30008	EC40009 / EM40010	CS40015/ EM40006	Computer Science &ML
EL30001	EE30047/ EE30024	EE30012/ EC30021	EC40001 / EL40003	EL40001 / EE40010	Automation
EE30013 / EE30015	EE30016 / EE30020	EE30014 EE30045	EE40013 / EE40017	EE40012 / EE40014	Energy

B. Tech. Honors/ Research Degree
in
Electronics and Computer Science Engineering

B. Tech in Electronics and Computer Science Engineering Program Educational Objectives (PEOs):

The B. Tech program in Electronics and Computer Science Engineering aims to prepare the graduates with the following objectives:

1. Lead a successful career in industries or undertake entrepreneurial endeavors and provide solutions in the areas of system design, analysis of algorithms & data, computer networking, and allied areas of Electronics and Computer Science Engineering or pursue advanced studies.
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 engineeringproblems.

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 knowledgeof, 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 receive clear 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) Ability to design and develop systems using suitable hardware and software tools for industrial data management and information communication requirements.

b) Ability to conduct research in networking, software engineering, embedded system, 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. programme in Electronics and Computer Science Engineering is 165.

PROFESSIONAL ELECTIVE

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 and Computer Science Engineering

SEMESTER III

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	MA21001	Probability and Statistics	3	1	0	4	4
2.	EC20001	Signals and Systems	3	0	0	3	3
3.	EC21001	Electronic Circuits	3	1	0	4	4
4.	CS21001	Data Structures	3	1	0	4	4
5.	CS20005	Computer System and Architecture	3	0	0	3	3
6.	EX20003	Scientific and Technical Writing	2	0	0	2	2
Total Credit (Theory Subjects)						**20**	**20**
Practical							
1.	EC29003	Signal Processing Lab	0	0	2	2	1
2.	CS29001	Data Structures Lab	0	0	2	2	1
Sessional							
1.		Vocational Electives	0	0	2	2	1
Total Credit (Practical and Sessional Subjects)						**6**	**3**
Total Credit (Semester)						**26**	**23**

SEMESTER IV

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	MA21002	Discrete Mathematics	3	1	0	4	4
2.	CS20002	Operating Systems	3	0	0	3	3
3.	EC20008	Communication Engineering	3	0	0	3	3
4.	CS20006	Database Management Systems	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.	EC29001	Electronic Circuits Lab	0	0	4	4	2
2.	CS29006	Database Management Systems Lab	0	0	2	2	1
3.	CS29008	Programming With Python and Java	0	0	4	4	2
Total Credit (Practical Subjects)						**10**	**5**
Total Credit (Semester)						**28**	**23**

SEMESTER V

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	CS30001	Design and Analysis of Algorithms	3	0	0	3	3
2.	EC20002	Microprocessors and Embedded Systems	3	0	0	3	3
3.	HS30401	Universal Human Values	3	0	0	3	3
4.		HASS Elective III	3	0	0	3	3
5.		Professional Elective-I	3	0	0	3	3
6.		Professional Elective-II	3	0	0	3	3
Total Credit (Theory Subjects)						**18**	**18**
Practical							
1.	CS39001	Algorithms Lab	0	0	2	2	1
2.	EC29002	Communication Engineering Lab	0	0	2	2	1
3.	EC29006	Microprocessors and Embedded Systems Lab	0	0	2	2	1
Sessional							
1.	EC38001	Electronics Product Development	0	0	2	2	1
2.	SAxxxx	K-Explore Open Elective-I	0	0	2	2	1
Total Credit (Practical Subjects)						**10**	**5**
Total Credit (Semester)						**28**	**23**

SEMESTER VI

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.	CS31001	Software Engineering	3	1	0	4	4
2.	EC30005	VLSI Circuits and Systems	3	0	0	3	3
3.	CS30003	Computer Networks	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)						**19**	**19**
Practical							
1.	CS33002	Applications Development Lab	0	0	4	4	2
2.	EC39001	VLSI Design Lab	0	0	2	2	1
3.	CS39003	Computer Networks Lab	0	0	2	2	1
Sessional							
1	EM37002	Minor Project	-	-	-	-	2
Total Credit (Practical Subjects)						**10**	**5**
Total Credit (Semester)						**29**	**24**

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

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1	EX40003	Engineering Professional Practice	3	0	0	3	3
2.		Professional Elective-IV	2	0	0	2	2
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**	**8**
Practical							
1.	EM47001	Project – I/ Internship	-	-	-	-	5
2.	EM48001	Practical Training	-	-	-	-	2
3.		MI- Lab/ MI project					2
Total Credit (Practical Subjects)							**7**
Total Credit (Semester)						**8**	**15**

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

Theory							
Sl. No	**Course Code**	**Course Title**	**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**	**6**
Sessional							
1.	EM47002	Project- II	-	-	-	-	9
Total Credit (Sessional)							**9**
Total Credit (Semester)						**6**	**15**

SEMESTER VII (B.Tech (Research))

Theory							
Sl. No	**Course Code**	**Course Title**	**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 of Theory						**8**	**8**
Sessional							
1.	EM47001	Project- I	-	-	-	-	5
2.	EM48001	Practical Training	-	-	-	-	2
3.		MI-Lab/ MI-Project (Optional)	-	-	-	-	2
Total of Sessional						**-**	**7**
Total						**8**	**15**

SEMESTER VIII (B.Tech (Research))

Theory							
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Credit**
1.		Research Elective-II	3	0	0	3	3
2.		MI-V (Optional)	3	0	0	3	3
		MI-VI(Optional)	3	0	0	3	3
Total of Theory						**3**	**3**
Sessional							
1.	EM47004	Project- II	-	-	-	-	12
Total of Sessional							**12**
Total						**3**	**15**

PROFESSIONAL ELECTIVE I/II/II

Sl. No	CourseCode	Course Title	L	T	P	Total	Credits
1.	CS30005	High Performance Computing	3	0	0	3	3
2.	CS30009	Distributed Operating System	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.	CS30023	Software Defined Networking	3	0	0	3	3
7.	CS30029	Computer Vision and Pattern Recognition	3	0	0	3	3
8.	EC30006	Hardware Description Language for Digital Design	3	0	0	3	3
9.	EC30007	ARM and Advanced Processors	3	0	0	3	3
10.	EC30008	Wireless Sensor Networks	3	0	0	3	3
11.	EC30009	Compound Semiconductor Basics	3	0	0	3	3
12.	EC30010	Mobile Ad Hoc Network	3	0	0	3	3
13.	EC30011	Digital System Design with Verilog	3	0	0	3	3
14.	EC30012	Nanoelectronics	3	0	0	3	3
15.	EC30013	Optical and Satellite Communication	3	0	0	3	3
16.	EC30015	Hardware and Software Co-Design of Embedded System	3	0	0	3	3
17.	EC30017	Audio & Speech Processing	3	0	0	3	3
18.	EC30019	Information Theory and Coding	3	0	0	3	3
19.	EC30021	Industrial IoT	3	0	0	3	3
20.	EL30001	Industrial Automation	3	0	0	3	3
21.	EM30007	Machine Learning based Signal Processing	3	0	0	3	3
22.	EM30008	Deep Learning: Algorithms and Implementation	3	0	0	3	3
23.	EM30009	Data Analytics	3	0	0	3	3
24	EM30011	Data Mining	3	0	0	3	3

PROFESSIONAL ELECTIVE –IV/ V

Sl. No	CourseCode	Course Title	L	T	P	Total	Credit
1.	CS40003	Software Testing and Autmation	3	0	0	3	3
2.	CS40005	Human Computer Interaction	3	0	0	3	3
3.	CS40007	Computer Graphics and Multimedia Systems	3	0	0	3	3
4.	CS40010	Augmented and Virtual Reality	3	0	0	3	3
5.	CS40012	Blockchain	3	0	0	3	3
6.	CS40015	Cryptography and Network Security	3	0	0	3	3
7.	EC40001	Optimization Techniques in Engineering	3	0	0	3	3
8.	EC40002	Millimetre Waves and Terahertz Technology	3	0	0	3	3
9.	EC40003	Cognitive Radio and Cooperative Communication	3	0	0	3	3
10.	EC40004	Quantum Communication	3	0	0	3	3
11.	EC40005	Analog and Mixed Signal IC Design	3	0	0	3	3
12.	EC40006	Advanced VLSI and SoC	3	0	0	3	3
13.	EC40007	Low Power VLSI Design	3	0	0	3	3
14.	EC40008	Advanced Computer Architecture and RISC-V	3	0	0	3	3
15.	EC40009	Biomedical Signal Processing	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

Suggested Bucket of Professional Electives

PE I	PE II	PE III	PE IV	PE V	Specialization
CS30005 / CS30009	CS30019 / EM30009 / EM30011	CS30023/ CS30010	CS40003/ CS40015/ CS40007	EM40006 / CS40010/ CS40012	Computer Science
EC30019	EC30013	EC30010/ EC30008	EC40003/ CS40015	EC40004 / EC40002	Communication & Networking
EC30009 / EC30007	EC30011 / EC30006	EC30015	EC40005 / EC40007	EC40006 / EC40008	VLSI & Embedded Design
CS30011 / EM30007	CS30029 / EC30017	EM30008 EM30009 / EM30011	EC40009 / EM40010 / CS40005	EM40001 / EM40008/ EC30021	ML and Applications

LIST OF HASS ELECTIVES

HASS Elective-II

Sl. No	Course Code	Subjects	L	T	P	Total	Credit
1.	HS20120	Economics of Development	3	0	0	3	3
2.	HS20122	International Economic Cooperation	3	0	0	3	3
3.	HS20220	Organizational Behaviour	3	0	0	3	3
4	HS20222	Human Resource Management	3	0	0	3	3

HASS Elective-III

Sl. No	Course Code	Subjects	L	T	P	Total	Credit
1.	HS30125	Market Structure and Pricing Policies	3	0	0	3	3
2.	HS30127	Pragmatic Inquiry	3	0	0	3	3
3.	HS30129	Economic Analysis of Decision Rules	3	0	0	3	3
4.	HS30131	Economics of Health and Education	3	0	0	3	3
5.	HS30223	Business Ethics and Corporate Governance	3	0	0	3	3
6.	HS30225	Leadership and Team Effectiveness	3	0	0	3	3
7.	HS30421	Gender Studies	3	0	0	3	3
8.	HS30423	Tribal Resource Management	3	0	0	3	3
9.	HS30425	Indian Knowledge System	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 Robots	0	0	2	1	1
5	ME28019	Modelling of Micro-Wind turbine by 3D CAD	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