



## Regulations for BTech in Electronics and Communications Engineering (ECE)

### 1. Preamble

IIIT Delhi aims to encourage research and innovation in Information Technology (IT) and allied areas. The objective of the BTech program in Electronics and Communications Engineering (ECE) is to prepare students to undertake careers involving innovation and problem solving using suitable techniques and hardware and software technologies, or to undertake advanced studies for research careers.

In order to give due importance to apply as well as theoretical aspects of ECE, the curriculum for the BTech (ECE) program covers most of the foundational aspects and also develops in students the engineering skills for problem solving. Towards this, the BTech (ECE) program at IIIT-Delhi starts with computing and Electronics courses first, and allows the possibility of doing science courses later. Besides being better suited for developing engineering capabilities, it also enables the possibility of students seeing newer applications and possibilities of using computing and electronics in these subjects.

The first year of the ECE program is common with CSE - this allows flexibility to students in moving from one to the other. The second year program is relatively fixed, comprising mostly of core courses for the program. 3<sup>rd</sup> year onwards the program can be mostly flexible comprising of electives, which may be organized as streams, including in Computer Science as well as domain areas.

This document specifies the specific regulations for the BTech (ECE) program – the general regulations for the BTech program are given in a separate document. These regulations are in addition to the regulations of the BTech program.

### 2. Program Structure

2.1 The set of core courses are shown in the table below (courses mentioned in [ ] are electives and actual courses for these slots are as defined from semester to semester.)

SEMESTER 1	SEMESTER 2	SEMESTER 3	SEMESTER 4	SEMESTER 5	SEMESTER 6
IP	DSA	<i>Circuit theory and Devices</i>	F&W	[DCS – core elect]	
DC	<i>Basic Electronics</i>	ELD	IE	[DSP – core elect]	
SM	IED	S&S	PCS		
Maths I	Maths II	Math III	Math IV		
COM	HSS/Eco	[HSS/AP]	{Science/Bio/..}	TCOM + Environment	

- 2.2 First year courses are common for both ECE and CSE students. All students do one course each in Maths, Software, Hardware, Systems/practice, and HSS/Comm. All courses, except HSS, are core courses.
- 2.3 The semester mentioned for the core courses is indicative and suggested, and they can be done later/earlier also. However, the pre-requisite requirements must be kept in mind by a student, if he/she wishes to do a core course in some other semester.

#### **2.4 Program Structure in 3<sup>rd</sup>/4<sup>th</sup> Years**

Most courses in Semester 5-8 are electives (an elective course is one which is not compulsory, and a student may have choices from which to select the courses he/she wants to do)

- 2.5 Some of the electives may be organized as *streams*, where a stream is a sequence of courses in an area providing a limited specialization in that area. Streams allow the student to focus on some area of ECE – as ECE is too diverse it is not possible for a student to gain a decent mastery in all. Streams allow the student to focus on a chosen area to gain a level of depth, and gain some understanding of other areas by doing some courses from other streams.
- 2.6 Besides electives and streams for specialized areas, streams and electives from domain areas (e.g. health, life sciences, finance, economics, E-Governance, sciences, etc.) may also be offered. A student may also be able to take CSE courses.

Note: Streams in the UG programs has now been discontinued. However, the students may be guided about the courses belonging to a certain area during the course counseling session conducted at the beginning of the semester. Guidance on streams should also be put on the website for information of the students.

- 2.7 There will also be a set of Humanities and Social Sciences (HSS) courses offered.

### **3 Requirements for Graduation**

For a BTech(ECE) degree, a student must satisfy all the following requirements:

- 3.1 Earn a total of 152 credits (equivalent to 38 full courses – 20 courses in the first two years, and 18 courses in the last two years.)
- 3.2 Successfully complete all the core courses.
- 3.3 Do at least 12 credits of Social Science and Humanities (SSH) Courses.
- 3.4 Do 2 credits of Community Work and Self Growth each. These are pass/fail credits, which are required to be completed, but do not count for fulfilling the credit requirement (i.e. these are in addition to the requirements mentioned above)
- 3.5 In the last 4 semesters, do at least 32 credits (8 full courses) of ECE courses. BTP/Independent project/Independent study/Undergraduate Research cannot count for this requirement. UGC may approve some other relevant courses (e.g. from Math, CSE, Computational Biology, etc.) to be counted as ECE courses for this purpose.
- 3.6 A BTech Project (BTP) is optional. A student opting for BTP may take a total of 8 to 12 credits of BTP

- 3.7 A student may take “Independent Project” or “Independent Study” or “Undergraduate Research” courses for 1, 2, or 4 credits. No more than 8 of these credits can count towards satisfying the credit requirements of the degree. Only students with satisfactory CGPA (at least 7.5) or with a strong interest in some area (the faculty advisor to determine this) can take these courses.
- 3.8 Credits of a BTP which is not completed will be treated as IP/IS/UR credits

#### **4 Honors Program**

The BTech(ECE) program has the Honors option, requirements for which are same as specified in the regulations for the BTech program. Namely;

- 4.1 The student must earn an additional 12 credits (i.e. must complete at least 164 credits)
- 4.2 The student’s program must include a BTech Project
- 4.3 At graduation time, the student must have a CGPA of 8.0 or more

#### **5 Suggested “Streams” for ECE**

Streams will evolve over time – based on trends as well as faculty interests. Some common streams that are possible are given below. Then nature of streams will evolve with time depending on the interests of faculty as well as relevance/importance of the areas.

1. Signal and Image Processing
2. RF and Communication Engineering
3. Circuits and VLSI
4. Controls and Embedded Systems

The courses in the streams will be of two types to serve dual purpose. On one hand there will be courses to train students in the fundamentals of the specific streams whereas on the other hand there will be advanced courses to train the students on the latest developments in those specific streams.

The suggested courses for some of the streams are given below. These courses can be added/deleted based on their relevance after taking feedback from industry and academia.

**Signal and Image Processing Courses:** Digital Signal Processing, Image Analysis, Advanced Signal Processing, Statistical Signal Processing, Compressive Sensing, Wavelet Transform and Applications, Multirate Signal Processing, Computer Vision, Multimedia Compression, Multimedia Security

**RF and Communication Engineering Courses:**Digital Communication System, Antennas Theory and Design, RF Circuit Design, Radar systems, RF Transceiver Design, Wireless Networks, Wireless System Implementation, Green Information and Communication Technology, Optical Communication System, Mobile Communication

**Circuits and VLSI Courses:**Digital VLSI Design, Analog CMOS Circuit Design, System on Chip Design and Test, Low Power Design, Memory Design, Mixed Signal Design, VLSI Design and Test Flow, RF Circuit Design, RF Transceiver Design

**Controls and Embedded Systems Courses:**Introduction to Robotics, Advanced Embedded Logic Design, Control Theory, Optimal Control Systems, Stochastic Estimation and Control, Computer Architecture, Multi Agent Systems

### Change History

Version July,2013: B.Tech.(ECE) regulation revised

**Version July,2014:** Only a few minor changes done.

#### **July,2015 release:**

- (i) B.Tech. (ECE) program revised w.e.f. Academic year 2015-16 \*
- (ii) BTP External discontinued
- (iii) BTP credits towards fulfilment of degree requirements reduced to 12.

#### **July,2016 release:**

- (i) Discontinuation of streams in UG program

July 2017 release

\*For students of 2014 and earlier batches the set of core courses are shown in the tables below (courses mentioned in [ ] are electives and actual courses for these slots are as defined from semester to semester.)

First year courses are common for both ECE and CSE students. Each of the two semesters, all students do one course each in Maths, Software, Hardware, Systems/practice, and HSS/Comm. All courses, except HSS, are core courses.

	<b>Sem 1</b>	<b>Sem 2</b>
<b>Hardware</b>	Digital circuits	Basic Computer Organization
<b>Software</b>	Intro to Programming	Data structures and Algos
<b>Systems/Practice</b>	System Management	Intro to Engineering Design
<b>Maths</b>	Math 1 (Linear Algebra)	Math 2 (Probability and Statistics)
<b>Communication Skills / HSS</b>	Com 1	[HSS 1]

### **Core Courses for ECE in 2<sup>nd</sup> Year**

In 3<sup>rd</sup> and 4<sup>th</sup> semesters, the course load will be same as in CSE – 5 courses, including one HSS/Communication Skills. These core courses are given below: These courses will become pre-requisites for advanced courses in some of the streams.

<b>Sem 3</b>	<b>Sem 4</b>
Linear Circuits	Principles of Communication Systems
Embedded Logic Design	Integrated Electronics
Signals & Systems	Fields and Waves
Math 3 (Complex Variables, Vector Calculus and ODEs)	Math 4 (Numerical Methods and Optimization)
[HSS 2]	Technical Communication (2 credits) Environment Studies (2 credits)