

# ORDINANCE

FOR

**ENGINEERING PROGRAMS**



(THIS ORDINANCE HAS BEEN APPROVED IN THE MEETING OF  
BOARD OF MANAGEMENT HELD ON DATED.....)

**APPLICABLE W.E.F. ACADEMIC SESSION 2019-2020**



SRI HARGOBINDGARH, PHAGWARA – HOSHIARPUR ROAD,  
PHAGWARA 144401, PUNJAB

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ROAD, PHAGWARA 144401, PUNJAB

## **ORDINANCE FOR** **ENGINEERING PROGRAMS**

### **SHORT TITLE AND COMMENCEMENT**

- I. This ordinance shall be called the ordinance for the Engineering Programs of GNA University, Phagwara.
- II. This ordinance shall come into force with effect from academic session 2019-20.

### **1. Name of Faculty: Faculty of Engineering, Design & Automation.(FEDA)**

### **2.General Regulations for Faculty of Engineering, Design and Automation:**

- The University may introduce programs under Faculty of Engineering, Design and Automation which are specified under the UGC Act 1956. The Governing Body may approve the introduction, suspending or phasing out a program on the recommendation of the Academic Council either on its own or on the initiative of faculty.
- The admissions to a Faculty of Engineering, Design and Automation programs shall be generally governed by the rules of the UGC/AICTE or any other competent authority of the MHRD or as approved by Governing Body of University and shall be as notified in the admission notification of the respective academic year.
- The minimum entry qualification for admission to the students of Faculty of Engineering, Design and Automation shall be such as may be laid down in the regulations or specified by the Governing Body like Minimum qualification for admission to the first year program of Faculty of Engineering, Design and Automation shall be the Senior Secondary School Certificate (10+2) examination. While deciding the admission procedure, the University may lay down compulsory subjects in qualifying examination for admission for various programs in the admission policy.
- A student shall be required to earn a minimum number of credits through various academic components of a curriculum, as provided for in the regulations.
- A student shall be required to complete all the requirements for the award of the degree within such period as may be specified in the regulations.
- A student may be granted such scholarship as may be specified in accordance with the directions of the Governing Body from time to time or regulations laid down for the same.

- A student admitted to the programs shall be governed by the rules, regulations and procedures framed and implemented by the University from time to time.
- The students shall abide by the regulations mentioned in student handbook issued by the University. These standing regulations shall deal with the discipline of the students in the Hostels, Faculty, and University premises or outside. The standing orders may also deal with such other matters as are considered necessary for the general conduct of the students' co-curricular and extra-curricular activities.
- In exceptional circumstances the chairman of Academic Council may, on behalf of the Council, approve amendments, modifications, Insertions or deletions of an Ordinance(s) which in his/her opinion is necessary or expedient for the smooth running of the program: provided all such changes are reported approved by the Council in its next meeting.

### 3. General Regulations for the Undergraduate Programs:

- **Short Title and Commencement:** These regulations shall be called regulations for the UG program in Faculty of Engineering, Design and Automation of the University and shall come into force on such a date as the Academic Council may approve.
- **Duration:** The duration of the UG program leading to degree of Bachelor of Technology shall be minimum four years and each year will comprise of two semesters. However, the duration may be extended up-to six years from the registered batch. The maximum duration of the programs excludes the period of withdrawal, due to medical reasons. However, it shall include the period of rustication or any other reason of discipline /academics e.g. detention, willful absence by the student, not getting promotion to the next class due to poor academic performance etc. Under detention, the student shall attend the University for an additional semester or more time, as equated to period of absence/suspension.
- **Starting or Phasing out of Program:** The University may offer such Undergraduate programs in Engineering leading to award the degree of Bachelor of Technology, as per nomenclature lay by the UGC regulations on the subject. A program may be phased out on recommendations of the Academic Council and approval of the Governing Body, on account of continuous low registration in the program or any other justifiable reason like becoming obsolete etc. Similarly, the Academic Council may approve starting of a new program or modifying the existing one on the recommendations of the Academic Council.

- **Admissions:** Admission in Engineering programs shall be made as per procedure approved by the Governing Body and may be reviewed periodically as required. Fee structure, refund policy, total number of seats, reservation policy, and or direct entry into II year through lateral entry scheme etc. shall be defined in the admission policy.
- **Eligibility for Admission:** 10+2 or equivalent (with Physics, Chemistry and Mathematics as compulsory subjects) with 50% (45 % for SC/ST/OBC) marks in aggregate from any recognized board.
- **Semester System:** The Engineering academic programs in the University shall be based on Semester System; namely, Even (Jan to June) and Odd (July to Dec) Semesters, in an academic year. The courses whether offered in regular semester shall be evaluated as per the policy and procedure laid down.
- **Semester Duration:** A semester will be of approximately 18-20 weeks duration. Of these, 90 days will be available for actual instructions including Mid Semester Exam.

4. **Curriculum:** The 4 years curriculum has been divided into 8 semesters and shall include lectures/tutorials/laboratory work/field work/outreach activity/project work/vocational training/viva/seminars/presentations/term papers/assignments etc. or a combination of some of these. The curriculum will also include other curricular, co-curricular and extra-curricular activities as may be prescribed by the University from time to time.

### 5. Choice Based Credit System:

The University has adopted Choice Based Credit System (CBCS), which provides an opportunity to the students to choose courses from the offered courses comprising of Core, Elective, Ability Enhancement and Audit Courses. The choice based credit system provides a “flexible” approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Following are the types of courses and structure for the program:

Course Categories		
I.	BSC	Basic Science Courses
II.	ESC	Engineering Science Courses
III.	HSMC	Humanities and Social Sciences including
		Management courses
IV.	PCC	Professional core courses
V.	PEC	Professional Elective courses
VI.	OEC	Open Elective courses
VII.	LC	Laboratory course
VIII.	MC	Mandatory courses (Audit Course)
IX.	PROJ	Project

#### Audit Course

The introduction of two Audit courses covering subjects of developing desired attitude among the learners is on the line of initiatives such as Unnat Bharat Abhiyan, Yoga, Value education, Disaster management, Sanskrit, Pedagogy, Constitution of India, Personality development through Indian culture etc.

## B.TECH AEROSPACE ENGINEERING.

### A. Program Outcomes:

- PO1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 Design/development of solutions:** 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.
- PO4 Conduct investigations of complex problems:** 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.
- PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- PO6 The engineer and society:** 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.
- Po7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge, and need for sustainable development.
- PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 Communication:** 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.

- **PO11 Project management and finance:** 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.
- **PO12 Life-long learning:** 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.

#### B. Program Specific Outcomes:

- **PSO1** Alumni of the program will use their breadth and depth of knowledge and skills in the fundamental disciplines of aerospace engineering to pursue successful professional careers.
- **PSO2** Educate students in the fundamental disciplines of Aerospace Engineering, aerodynamics, materials, structures, propulsion, flight mechanics, space mechanics, system and instruments, and stability and control.
- **PSO3** Educate students in the basics of instrumentation and measurement, laboratory techniques and how to design and conduct experiments.

#### C. Program Structure: As per GNA University.

##### Details of Courses under B.Tech Aerospace Engineering

S. No	Course Category	Theory	Theory & Tutorial	Practical	Theory & Practical	Total Credits
1	Bsc	NIL	4X4 = 16 1X3= 3	2X1 = 2	NIL	21
2	Esc	2X3 = 6	1X4 = 4	2X1 = 2 2X2 = 4	2X3 = 6	22
3	HSMC	2X3 = 6 2X2 = 4	NIL	2X1 = 2	NIL	12
4	PCC	3X3 = 9 1X2 = 2	9X4 = 36 2X5 = 10	6X1 = 6 1X2=2	NIL	65
5	PEC	4X3 = 12	2X4=8	NIL	NIL	20
6	OEC	5X3 = 15	NIL	NIL	NIL	15
7	LC	<b>18 courses of 24 credit</b>				
8	MC	4X0 = 0	NIL	NIL	NIL	
9	PROJ	NIL	NIL	1X1 = 1 1X4 = 4 1X8 = 8 1X2 = 2	NIL	15
<b>Total Credits</b>		54	77	33	6	<b>170</b>

Note: Subject X Hours = Credits

ENGINEERING PROGRAMS

#### Semester I (First year) Group A

##### Branch/Course: Aerospace Engineering

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
		BTM102	Mathematics – I							
3	Engineering Science course	BCS 101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME101	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS 121	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	English Communication Lab	0	0	2	30	20	50	1
10	Mandatory courses	BMC001	Environmental Science	2	0	0	40	0	40	S/US (Non-Credit)
<b>Total</b>				<b>14</b>	<b>2</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>21</b>

\*The course Mathematics - I (BTM102) is offered in Engineering Computer Science and Engineering only

**Semester I (First year) Group B**

**Branch/Course: Aerospace Engineering**

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
		*BTM102	Mathematics-I							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME101	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	English Communication Lab	0	0	2	30	20	50	1
10	Mandatory Courses	BMC001	Environmental Science	2	0	0	40	0	40	S/US (Non-Credit)
<b>Total</b>				<b>14</b>	<b>3</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>22</b>

**Semester II (First year) GROUP A**

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics – II							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME201	Engineering Drawing and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM201	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>3</b>	<b>13</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>22</b>

## Semester II (First year) -GROUP-B

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics-II							
3	Engineering Science course	BCS101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME201	Engineering Drawing and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM201	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS122	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>2</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>21</b>

## Semester III (Second year)

Branch/Course: Aerospace Engineering

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BAE301	Introduction to Aerospace Engineering	3	0	0	40	60	100	3
2	Professional Core Courses	BAE302	Aircraft Materials	3	0	0	40	60	100	3
3	Professional Core Courses	BME304	Engineering Thermodynamics	3	0	0	40	60	100	3
4	Professional Core Courses	BME402	Fluid Mechanics	3	1	0	40	60	100	4
5	Professional Core Courses	BMT301	Applied Mechanics	3	0	0	40	60	100	3
6	Mandatory courses	BMC002	Constitution of India	2	0	0	40	0	40	0
7	Summer Training	BAE300	Summer Training	0	0	4	30	20	50	S/US (Non Credit)
8	Engineering Science course	BME422	Fluid mechanics Lab	0	0	2	30	20	50	1
9	Engineering Science course									
10			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>17</b>	<b>1</b>	<b>6</b>	<b>300</b>	<b>340</b>	<b>640</b>	<b>17</b>

\* The students will take 4 weeks in- house summer Internship after 2<sup>nd</sup> semester.

## Semester IV (Second year)

Branch/Course: Aerospace Engineering

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BAE401	Aircraft Propulsion - 1	3	1	0	40	60	100	4
2	Professional Core Courses	BAE402	Elements of Aerodynamics	3	1	0	40	60	100	4
3	Professional Core Courses	BME301	Strength of Materials	3	1	0	40	60	100	4
4	Basic Science course	BTM301	Transform & Discrete Mathematics	3	1	0	40	60	100	4
5	Humanities & Social Sciences including Management courses	HVE001	Human Values and Professional Ethics	3	0	0	40	60	100	3
6	Professional Core Courses	BAE421	Aircraft Propulsion -1 Lab	0	0	2	30	20	50	1
7	Professional Core Courses	BME321	Strength of Materials Laboratory	0	0	2	30	20	50	1
8			HONOUR ELECTIVE /MINOR ELECTIVE							
<b>Total</b>				<b>15</b>	<b>4</b>	<b>4</b>	<b>260</b>	<b>340</b>	<b>600</b>	<b>21</b>

## Semester V (Third year)

Branch/Course: Aerospace Engineering

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BAE501	Aircraft Propulsion - 2	3	1	0	40	60	100	4
2	Professional Core Courses	BAE502	Aerospace Vehicle Structures - 1	4	1	0	40	60	100	5
3	Professional Core Courses	BAE503	Aircraft Performance	3	1	0	40	60	100	4
4	Professional Core Courses	BMA302	Computer Aided Design – I	2	0	0	40	60	100	2
5	Open Elective Courses		Open Electives	3	0	0	40	60	100	3
6	Professional Core Courses	BMA322	Computer Aided Design– I Laboratory	0	0	4	60	40	100	2
7	Professional Core Courses	BAE521	Aircraft Propulsion– 2 Lab	0	0	2	30	20	50	1
8	Industrial Training*	BAE500	Industrial Training	0	0	0	50	50	100	2
9			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>15</b>	<b>3</b>	<b>6</b>	<b>340</b>	<b>410</b>	<b>750</b>	<b>23</b>

\* The students will take 6-8 weeks industrial training in Industry after semester 4th.



## Semester VI (Third year)

Branch/Course: Aerospace Engineering

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BAE601	Aircraft Stability and Control	3	1	0	40	60	100	4
2	Professional Core Courses	BAE602	Advanced Aerodynamics	3	1	0	40	60	100	4
3	Professional Core Courses	BAE603	Aerospace Vehicle Structures- 2	4	1	0	40	60	100	5
4	Professional Elective Courses		Core Elective –I	3	0	0	40	60	100	3
5	Open Elective Courses		Open Electives	3	0	0	40	60	100	3
6	Humanities & Social Sciences including Management courses	OPR001	Operations Research	3	0	0	40	60	100	3
7	Professional Core Courses	BAE622	Advanced Aerodynamics Lab	0	0	2	30	20	50	1
8	Professional Core Courses	BAE623	Aerospace Vehicle Structures– 2 Lab	0	0	2	30	20	50	1
9			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>19</b>	<b>3</b>	<b>4</b>	<b>300</b>	<b>400</b>	<b>700</b>	<b>24</b>

Core Elective –I	
BAE641	Composite Materials
BAE642	Air Transportation And Maintenance
BAE643	Rockets Propulsion

## Semester VII (Fourth year)

Branch/Course: Aerospace Engineering

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BAE701	Aircraft System And Instrumentation	3	0	0	40	60	100	3
2	Professional Elective Courses	BAE741	Aircraft Design	3	1	0	40	60	100	4
3	Professional Elective Courses		Core Elective –II	3	0	0	40	60	100	3
4	Open Elective Courses		Open Electives	3	0	0	40	60	100	3
5	Open Elective Courses		Open Electives	3	0	0	40	60	100	3
6	Professional Core Courses	BAE721	Aircraft System And Instrumentation Lab	0	0	2	30	20	50	1
7	PROJ	BAE700	Minor Project	0	0	8	50	50	100	4
8	Industrial Training*	BAE500	Industrial Training	0	0	0	0	0	0	0
9			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>15</b>	<b>1</b>	<b>10</b>	<b>280</b>	<b>370</b>	<b>650</b>	<b>21</b>

\* The students will take 4 weeks industrial training in Industry after semester 6th.

Core Elective –II	
BAE742	Computational Fluid Dynamics
BAE743	Fatigue and Fracture Mechanics
BAE744	Vibrations and Aeroelasticity

## Semester VIII (Fourth year)

Branch/Course: Aerospace Engineering

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Elective Courses	BAE841	Space Dynamics	3	1	0	40	60	100	4
2	Professional Elective Courses		Core Elective –III	3	0	0	40	60	100	3
3	Open Elective Courses		Open Electives	3	0	0	40	60	100	3
4	Open Elective Courses		Open Electives	3	0	0	40	60	100	3
5	PROJ	BAE800	Major Project	0	0	16	50	50	100	8
6			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>12</b>	<b>1</b>	<b>16</b>	<b>210</b>	<b>290</b>	<b>500</b>	<b>21</b>

Core Elective –III	
BAE842	Helicopter Engineering
BAE843	Automatic Flight Control
BAE844	Avionics

## LIST OF PROFESSIONAL ELECTIVES COURSES

## \*Elective –I

Course Code	Course Title
BAE641	Composite Materials
BAE642	Air Transportation And Maintenance
BAE643	Rockets Propulsion

## \*\*Elective –II

Course Code	Course Title
BAE742	Computational Fluid Dynamics
BAE743	Fatigue and Fracture Mechanics
BAE744	Vibrations and Aeroelasticity

## \*\*\*Elective – III

Course Code	Course Title
BAE842	Helicopter Engineering
BAE843	Automatic Flight Control
BAE844	Avionics

\* **B.TECH HONOURS** – Students Has to Select One Technical Course from MOOC's Starting from Third Semester of Their Choice In Addition To the above Mentioned Subjects.

\* **MINOR ENGINEERING** - Students Has To Select One Open Course From The List Of Minor Electives.

Course Code	Course Title
BME031	Electric and Hybrid Vehicle
BME032	Industrial Engineering
BME033	Introduction to Hydraulics and Pneumatics
BME034	Basic Thermodynamics and Heat Transfer
BME035	Energy Conservation
BME036	Solar Energy Utilisation
BME037	Material Handling System
BME038	Production and Operation management
BME039	Non-Destructive Testing
BMA031	Object Oriented Programming
BMA032	LAN and Networking
BMA033	Computer Architecture
BMA034	Electronic Devices and Circuits
BMA035	Electrical Machines and Power Systems
BMA037	Entrepreneurship
BMA038	Database Management System
BMA039	Management Information System
BEE031	Advance Programming with MATLAB
BEE032	Industrial Robotics and control
BEE033	Network Securities
BEE034	Artificial Intelligence
BEE035	PLC and SCADA
BEE036	Internet of Things
BEE037	Biomedical Instrumentation
BEE038	Nano electronics
BEE039	Composite Materials
BAE031	Introduction to Aerospace Engineering
BAE032	Aircraft Materials
BCS 731	Biometric Security
BCS 732	Project Management & Entrepreneurship
BCS 733	E-business
BCS 734	Geographical Information System
BCS 831	Computer Forensics
BCS 832	Geo-informatics
BCS 833	Computer Human Interaction
BCS 834	Security in Computing
BCS 835	Cyber law and IPR
BCS 836	Green Computing
BCS 837	Signals and Systems
BCS 838	Expert System
BCE031	Water pollution and its management
BCE032	Global warming and Climate Change
BCE033	Disaster Management and Mitigation
BCE034	Soil Chemistry and its impact
BCE035	Energy engineering technological and management
BCE036	Renewable energy technology
BCE037	Industrial pollution prevention and control
BCE038	Numerical method

#### LIST OF COURSES FOR ADDITIONAL MINOR ENGINEERING

In order to have an additional **Minor Engineering**, a student has to earn additional minimum 20 credits from the following list. In B. Tech Aerospace Engineering we are offering following minor in engineering degree

1.B.Tech Aerospace Engineering with Minor in **Mechanical Engineering**

2.B.Tech Aerospace Engineering with Minor in **Mechatronics Engineering**

In order to have a minor engineering in **Aerospace Engineering**, the student must enroll for the following courses in addition.

Sr. No.	Semester	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	3 <sup>rd</sup>	BAE301	Introduction to Aerospace Engineering	3	0	0	40	60	100	3
2	4 <sup>th</sup>	BAE401	Aircraft Propulsion-I	3	1	0	40	60	100	4
3	4 <sup>th</sup>	BAE421	Aircraft Propulsion-I Laboratory	0	0	2	30	20	50	1
4	5 <sup>th</sup>	BAE504	Elements of Aerodynamics	3	1	0	40	60	100	4
5	6 <sup>th</sup>	BAE601	Aircraft Stability And Control	3	1	0	40	60	100	4
6	7 <sup>th</sup>	BAE701	Aircraft System And Instrumentation	3	0	0	40	60	100	3
7	7 <sup>th</sup>	BAE721	Aircraft System And Instrumentation Laboratory	0	0	2	30	20	50	1
<b>Total</b>				<b>15</b>	<b>3</b>	<b>4</b>	<b>260</b>	<b>340</b>	<b>600</b>	<b>20</b>

## B.Tech Aerospace Engineering with Minor in Mechanical Engineering

Sr. No.	Semester	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	3 <sup>rd</sup>	BME641	Internal Combustion Engine	3	0	0	40	60	100	3
2	4 <sup>th</sup>	BME402	Manufacturing Processes	3	0	0	40	60	100	3
3	4 <sup>th</sup>	BME422	Manufacturing Processes Lab	0	0	2	30	20	50	1
4	5 <sup>th</sup>	BME501	Heat Transfer	3	1	0	40	60	100	4
5	5 <sup>th</sup>	BME521	Heat Transfer Lab	0	0	2	30	20	50	1
6	6 <sup>th</sup>	BME602	Industrial Instrumentation and Metrology	3	0	0	40	60	100	3
7	6 <sup>th</sup>	BME622	Industrial Instrumentation and Metrology Laboratory	0	0	2	30	20	50	1
8	7 <sup>th</sup>	BME701	Mechanical Vibration	3	0	0	40	60	100	3
9	7 <sup>th</sup>	BME721	Mechanical Vibration Lab	0	0	2	30	20	50	1
10	8 <sup>th</sup>	BME741	Refrigeration and Air-Conditioning	3	0	0	40	60	100	3
<b>Total</b>				<b>18</b>	<b>1</b>	<b>8</b>	<b>360</b>	<b>440</b>	<b>800</b>	<b>23</b>

## B.Tech Aerospace Engineering with Minor in Mechatronics Engineering

Sr. No.	Semester	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	3 <sup>rd</sup>	BMT 301	Digital Electronics	3	0	0	40	60	100	3
2	3 <sup>rd</sup>	BMT 321	Digital Electronics Lab	0	0	2	30	20	50	1
3	4 <sup>th</sup>	BMT 402	Manufacturing Processes	3	0	0	40	60	100	3
4	4 <sup>th</sup>	BMT 422	Manufacturing Processes Lab	0	0	2	30	20	50	1
5	5 <sup>th</sup>	BMT 503	Hydraulics and Pneumatics	3	1	0	40	60	100	4
6	5 <sup>th</sup>	BMT 523	Hydraulics and Pneumatics Lab	0	0	2	30	20	50	1
7	6 <sup>th</sup>	BMT 603	Machine Design	3	0	0	40	60	100	3
8	7 <sup>th</sup>	BMT 701	Programmable Logic Controller	3	0	0	40	60	100	3
9	7 <sup>th</sup>	BMT 721	Programmable Logic Controller Lab	0	0	2	30	20	50	1
10	8 <sup>th</sup>	BMT 841	Additive Manufacturing	3	0	0	40	60	100	3
<b>Total</b>				<b>18</b>	<b>1</b>	<b>8</b>	<b>360</b>	<b>440</b>	<b>800</b>	<b>23</b>

**FOR HONOURS DEGREE**

A student will be eligible to get B. Tech Mechanical Engineering with Honours, if he/she completes an additional 20 credits. These could be acquired through MOOCs/NPTEL courses subject to approval by the Dean/Head of the Faculty of Engineering Design and Automation

**D. In-House Summer Internship:**

- In-house summer internship is a core course, to be done typically during the summer vacations. A student should undergo summer internship for 4 weeks, starting after year 1<sup>st</sup>, in the campus. Training of 2<sup>nd</sup> semester shall be graded and is essential part of the degree requirement in 3<sup>rd</sup> semester.
- Each Faculty shall nominate training coordinator from amongst the faculty members. The faculty will scrutinize the training report and will award marks, which must be sent to the controller of examination office. The summer training, submission of training report and obtaining pass grade is mandatory requirement for award of B.Tech Aerospace Engineering degree.

**E. Industrial Training:**

A student should undergo industrial training for 6-8 weeks, starting after semester 4<sup>th</sup> and 6<sup>th</sup>, preferably in an industry, R & D institutions or in an academic institution of repute permitted. Training of 4<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 5<sup>th</sup> semester and training of 6<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 7<sup>th</sup> semester. This industrial training program is compulsory and an integral part of the Program. The Placement Officer will assist the students in finding suitable training assignments / projects.

The industrial training aims at achieving the following objectives:

- (I) Application of knowledge and techniques learnt in the first and second year to real life situation and make them better prepared to enrich their learning in the upcoming semesters.

- (ii) Appreciating the inter-linkage among different functions and developing a realistic perspective about organizations in their totality. The students should take the industrial training seriously. They are expected to diligently in the job. A faculty member will work closely with the company to define the scope of the industrial training and ensure proper understanding of the terms of engagement by all concerned. The student should be ready to not only learn from the followed practices in the Industry but also present a professional front i.e. being punctual at the workplace, well behaved and appropriately dressed. At the end of the training, the student should submit a brief report explaining briefly the key learning points and the insights gained. A 'certificate of completion' from the host organization is essential. The Industry training shall be credited as approved in the curricula. The industrial training, submission of training report and obtaining pass grade is mandatory requirement for award of B.Tech Aerospace Engineering degree.

- F. Major Project:** A major project shall be a multifaceted assignment that serves as a culminating academic and intellectual experience for students, typically during their final year at the University. Major projects may take a wide variety of forms, but they shall be Semester long investigative projects that culminate in a final product, presentation, or performance. In projects under the guidance of a faculty member, a final year student is required to do some innovative work with application of knowledge earned while undergoing various courses and labs in the earlier years. The student is expected to do literature survey and carry out development and/or experimentation. Through the project work the student must exhibit both the analytical and practical skills. The student will have to do his/her project under the guidance of the faculty member from the same department unless specifically permitted by the Head of the Department for alternate arrangements.

## B.TECH CIVIL ENGINEERING.

### A. Program Outcomes:

- PO1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 Design/development of solutions:** 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.
- PO4 Conduct investigations of complex problems:** 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.
- PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- PO6 The engineer and society:** 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.
- PO7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 Communication:** 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.

- PO11 Project management and finance:** 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.
- PO12 Life-long learning:** 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.

### B. Program Specific Outcomes:

- **PSO1** To carryout surveying, prepare layout plans, maps for structures and alignments for canals and roads.
- **PSO2** To specify, analyze, design, estimate and supervise construction activities such as, test and evaluate foundations and superstructures for buildings, industries, irrigation and hydraulic structures, highways, railways, airports, docks and harbors.
- **PSO3** To understand the impact of water, air and noise pollution; the methods of waste collection, disposal and processing; specify, design and analyze water supply system, sewerage and industrial effluent conveying and treatment systems.

### C. Program Structure: As per GNA University.

#### Details of Courses under B.Tech Civil Engineering

S. No	Course Category	Theory	Theory & Tutorial	Practical	Theory & Practical	Total Credits
1	BSC	NIL	5*4 = 20	2*1 = 2	NIL	22
2	ESC	2*3 = 6	1*4 = 4	3*2 = 6 1*3 = 3 2*1 = 2	2*3=6	27
3	HSMC	1*2=2 1*3=3	NIL	NIL	2*3=6	11
4	PCC	4*3=12	9*4=36	1*2 = 2 8*1 = 8	NIL	58
5	PEC	8*3 = 24	NIL	NIL	NIL	24
6	OEC	3*3 = 9	NIL	NIL	NIL	9
7	MC	NIL	NIL	NIL	NIL	0
8	PROJ	NIL	NIL	1*2 = 2 1*1 = 1 1*4 = 4 1*8 = 8	NIL	15
9	LC	15 courses of 38 credits				----
<b>Total Credits</b>		<b>56</b>	<b>60</b>	<b>38</b>	<b>12</b>	<b>166</b>

## Semester I (First year) - GROUP-A

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
		*BTM102	Mathematics – I							
3	Engineering Science course	BCS 101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME101	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS 121	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	English Communication Lab	0	0	2	30	20	50	1
10	Mandatory courses	BMC001	Environmental Science	2	0	0	40	0	40	S/US (Non-Credit)
<b>Total</b>				<b>14</b>	<b>2</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>21</b>

\*The course Mathematics - I (BTM102) is offered in B. Tech. Computer Science and Engineering only.

## Semester I (First year) - GROUP-B

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
		*BTM102	Mathematics-I							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME101	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	English Communication Lab	0	0	2	30	20	50	1
10	Mandatory courses	BMC001	Environmental Science	2	0	0	40	0	40	S/US (Non-Credit)
<b>Total</b>				<b>14</b>	<b>3</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>22</b>

\* The course Engineering Physics (BTP101) and Engineering Physics Laboratory (BTP121) are offered to B.Tech. Mechanical, Civil, and Aerospace Engineering

\*\*The course Semiconductor Physics (BTP102) and Semiconductor Physics Laboratory (BTP122) are offered to B.Tech. Electronics and communication, Mechatronics, Mechanical and Automation, Robotics and Automation Engineering, and Computer Science Engineering

\*The course Mathematics – I (BTM102) is offered in B. Tech. Computer Science and Engineering only.

## Semester II (First year) -GROUP-A

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics-II							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME201	Engineering Drawing and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM201	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>3</b>	<b>13</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>22</b>

\* The course Engineering Physics (BTP101) and Engineering Physics Laboratory (BTP121) are offered to B.Tech. Mechanical, Civil, and Aerospace Engineering

\*\*The course Semiconductor Physics (BTP102) and Semiconductor Physics Laboratory (BTP122) are offered to B.Tech. Electronics and communication, Mechatronics, Mechanical and Automation, Robotics and Automation Engineering, and Computer Science Engineering

†The course Mathematics - II (BTM202) is offered in B. Tech Computer Science and Engineering only.

**Note: There shall be a summer internship of 4 weeks duration at the end of 2<sup>nd</sup> semester. The assessment for this will be included in the 3<sup>rd</sup> semester.**

## Semester II (First year) -GROUP-B

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics – II							
3	Engineering Science course	BCS 101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME201	Engineering Drawing and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS 121	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>2</b>	<b>13</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>21</b>

†The course Mathematics - II (BTM202) is offered in B. Tech. Computer Science and Engineering only. It will be included in the 3<sup>rd</sup> semester.

**Note: There shall be a summer internship of 4 weeks' duration at the end of 2<sup>nd</sup> semester. The assessment for this will be included in the 3<sup>rd</sup> semester.**



## Semester III (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BME301	Strength of Materials	3	1	0	40	60	100	4
2	Professional Core Courses	BCE301	Fluid Mechanics And Hydraulics	3	1	0	40	60	100	4
3	Engineering Science Courses	BCE322	Computer-aided Civil Engineering drawing	0	0	4	30	20	50	2
4	Professional Core Courses	BCE302	Building Material & Construction	3	0	0	40	60	100	3
5	Professional Core Courses	BME321	Strength of Materials Laboratory	0	0	2	30	20	50	1
6	Professional Core Courses	BCE321	Fluid Mechanics and Hydraulics Laboratory	0	0	2	30	20	50	1
7	Mandatory Courses	BMC002	Constitution of India	2	0	0	40	0	40	S/US (Non-Credit)
8			HONOUR ELECTIVE/ MINOR ELECTIVE							
9	Summer Training	BCE300	Summer Internship*	-	-	-	40	-	40	S/US (Non-Credit)
<b>Total</b>				<b>11</b>	<b>2</b>	<b>8</b>	<b>290</b>	<b>240</b>	<b>530</b>	<b>15</b>

\*Summer internship will imparted internally at the end of 2<sup>nd</sup> semester for four (04) weeks duration.

## Semester IV (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BCE401	Engineering Surveying	3	0	0	40	60	100	3
2	Professional Core Courses	BCE402	Structural analysis	3	1	0	40	60	100	4
3	Professional Core Courses	BCE403	Irrigation Engineering	3	1	0	40	60	100	4
4	Basic Science Course	BTM301	Transform & Discrete Mathematics	3	1	0	40	60	100	4
5	Humanities & Social Sciences including Management courses	HVE001	Human Values and Professional Ethics	3	0	0	40	60	100	3
6	Professional Core Courses	BCE421	Engineering Surveying Laboratory	0	0	4	30	20	50	2
7	Professional Core Courses	BCE422	Structural analysis Laboratory	0	0	2	30	20	50	1
8	Open Elective Courses		Open Elective	3	0	0	40	60	100	3
9			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>18</b>	<b>3</b>	<b>6</b>	<b>300</b>	<b>400</b>	<b>700</b>	<b>24</b>

There shall be survey camp of two weeks' duration at the end of the 4th semester. The assessment for this will be included in the 5<sup>th</sup> semester.

## Semester V (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BCE501	Soil Mechanics	3	1	0	40	60	100	4
2	Professional Core Courses	BCE502	Design of Concrete Structures	3	1	0	40	60	100	4
3	Professional Core Courses	BCE503	Transportation Engineering	3	0	0	40	60	100	3
4	Humanities & Social Sciences including Management courses	CIV001	Civil engineering-societal & global impact	2	0	0	40	60	100	2
5	Industrial Training*	BCE500	Survey Camp	-	-	-	50	50	100	2
6	Professional Core Courses	BCE521	Soil Mechanics Laboratory	0	0	2	30	20	50	1
7	Professional Core Courses	BCE522	Design of Concrete Structures Laboratory	0	0	2	30	20	50	1
8	Professional Core Courses	BCE523	Transportation Engineering Laboratory	0	0	2	30	20	50	1
9	Professional Core Courses		Elective-I	3	0	0	40	60	100	3
10			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>14</b>	<b>2</b>	<b>6</b>	<b>340</b>	<b>410</b>	<b>750</b>	<b>21</b>

\* Survey camp will imparted in hilly area at the end of 4<sup>th</sup> semester for two (02) weeks duration.

## Semester VI (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BCE601	Design of Steel Structures	3	1	0	40	60	100	4
2	Professional Core Courses	BCE602	Water Supply Engineering	3	0	0	40	60	100	3
3	Professional Core Courses	BCE603	Advanced Structural analysis	3	1	0	40	60	100	4
4	Professional Elective Courses		Elective – II	3	0	0	40	60	100	3
5	Professional Elective Courses		Elective – III	3	0	0	40	60	100	3
6	PROJ	BCE600	Minor Project*	0	0	2	50	50	100	1
7	Professional Core Courses	BCE621	Design of Steel Structures Laboratory	0	0	2	30	20	50	1
8	Professional Core Courses	BCE622	Water Supply Engineering Laboratory	0	0	2	30	20	50	1
9	Open Elective Courses		Open Elective	3	0	0	40	60	100	3
10			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>18</b>	<b>2</b>	<b>6</b>	<b>350</b>	<b>450</b>	<b>800</b>	<b>23</b>

**NOTE: Students will complete three chapters of introduction, literature review and methodology including requirements of their final project in Minor project.**

## Semester VII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Elective Courses		Elective-IV	3	0	0	40	60	100	3
2	Professional Elective Courses		Elective-V	3	0	0	40	60	100	3
3	Professional Elective Courses		Elective-VI	3	0	0	40	60	100	3
4	PCC	BCE701	Advanced Reinforced Concrete Design	3	1	0	40	60	100	4
5	PROJ	BCE700	Major Project	0	0	8	50	50	100	4
6	Open Elective Courses		Open Elective	3	0	0	40	60	100	3
7	Engineering Science Courses	BCE721	Computer added structural analysis design	0	0	6	30	20	50	3
8			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>15</b>	<b>1</b>	<b>14</b>	<b>280</b>	<b>370</b>	<b>650</b>	<b>23</b>

## Semester VIII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Elective Courses		Elective – VII	3	0	0	40	60	100	3
2	Professional Elective Courses		Elective – VIII	3	0	0	40	60	100	3
3	ESC		Energy Science and Engineering	3	0	0	40	60	100	3
4	PROJ	BCE800	Industrial Defined Project	0	0	16	50	50	100	8
5			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>9</b>	<b>0</b>	<b>16</b>	<b>170</b>	<b>230</b>	<b>400</b>	<b>17</b>

\* **B.TECH. HONOURS** – Students has to earn additional minimum 20 credits from MOOC's by selecting Civil engineering technical courses starting from third semester of their choice in addition to the above-mentioned subjects.

\* **MINOR ENGINEERING** - Students has to select one open course from the list of minor electives.

## Elective –I

Course Code	Course Title
BCE541	Hydrology and water resources engineering
BCE542	Rock Mechanics and Engineering Geology
BCE543	Advanced Construction techniques
BCE544	Construction Planning and Orientation

## Elective II &amp; III

Course Code	Course Title
BCE641	Geomatics engineering
BCE642	GPS surveying
BCE643	Concrete Composite Material
BCE644	Smart city and urban planning
BCE645	Foundation engineering
BCE646	Material, testing & Evaluation
BCE647	Forensic Civil Engineering
BCE648	Industrial Waste Management

**Elective –IV, V & VI**

Course Code	Course Title
BCE741	Advanced steel structure design
BCE742	Bridge engineering
BCE743	Structural Dynamic
BCE744	Railway and airport engineering
BCE745	Urban Planning and sustainable development
BCE746	Design and construction of pavement
BCE747	Reinforced earth and geotextiles
BCE748	Soil Dynamics and Machine Foundation
BCE749	Construction engineering and project management

**Elective –VII & VIII**

Course Code	Course Title
BCE841	Estimation and costing professional practice
BCE842	Wastewater engineering
BCE843	Pre-stressed concrete engineering
BCE844	Earthquake Resistant structure
BCE845	Ground improvement techniques
BCE846	Repair and rehabilitation of structure
BCE847	Advanced irrigation engineering

Course Code	Course Title
BME031	Electric and Hybrid Vehicle
BME032	Industrial Engineering
BME033	Introduction to Hydraulics and Pneumatics
BME034	Basic Thermodynamics and Heat Transfer
BME035	Energy Conservation
BME036	Solar Energy Utilisation
BME037	Material Handling System
BME038	Production and Operation management
BME039	Non-Destructive Testing
BMA031	Object Oriented Programming
BMA032	LAN and Networking
BMA033	Computer Architecture
BMA034	Electronic Devices and Circuits
BMA035	Electrical Machines and Power Systems
BMA037	Entrepreneurship
BMA038	Database Management System
BMA039	Management Information System
BEE031	Advance Programming with MATLAB
BEE032	Industrial Robotics and control
BEE033	Network Securities
BEE034	Artificial Intelligence
BEE035	PLC and SCADA
BEE036	Internet of Things
BEE037	Biomedical Instrumentation
BEE038	Nano electronics
BEE039	Composite Materials
BAE031	Introduction to Aerospace Engineering
BAE032	Aircraft Materials
BCS 731	Biometric Security
BCS 732	Project Management & Entrepreneurship
BCS 733	E-business
BCS 734	Geographical Information System
BCS 831	Computer Forensics
BCS 832	Geo-informatics
BCS 833	Computer Human Interaction
BCS 834	Security in Computing
BCS 835	Cyber law and IPR
BCS 836	Green Computing
BCS 837	Signals and Systems
BCS 838	Expert System
BCE031	Water pollution and its management
BCE032	Global warming and Climate Change
BCE033	Disaster Management and Mitigation
BCE034	Soil Chemistry and its impact
BCE035	Energy engineering technological and management
BCE036	Renewable energy technology
BCE037	Industrial pollution prevention and control
BCE038	Numerical method

Open Electives	
EPI031	Economic Policies in India
MSE032	Metro system & engineering
WPM035	Water Pollution and its Management
BCS036	Geo-informatics
BCS037	Cyber Laws & IPR
BCS038	Global warming and climate change
SCI033	Soil Chemistry and its impact
BCS034	Geographical Information System

#### LIST OF COURSES FOR ADDITIONAL MINOR ENGINEERING

In order to have an additional Minor Engineering in Civil, a student has to earn additional minimum 20 credits either from the following courses or through MOOCs/NPTEL courses subject to approval by the Dean/Head of the Faculty of Engineering Design and Automation.

Sr. No.	Semester	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
2	3 <sup>rd</sup>	BCE303	Building Material & Construction	3	0	0	40	60	100	3
3	4 <sup>th</sup>	BCE401	Engineering Surveying	3	0	0	40	60	100	3
	4 <sup>th</sup>	BCE421	Engineering Surveying Laboratory	0	0	4	30	20	50	2
3	5 <sup>th</sup>	BCE501	Soil Mechanics	3	1	0	40	60	100	4
	5 <sup>th</sup>	BCE521	Soil Mechanics Laboratory	0	0	2	30	20	50	1
4	5 <sup>th</sup>	BCE522	Design of Concrete Structures Laboratory	0	0	2	30	20	50	1

#### FOR HONOURS DEGREE

A student will be eligible to get B. Tech Civil Engineering with Honours, if he/she completes an additional 20 credits. These could be acquired through MOOCs/NPTEL courses subject to approval by the Dean/Head of the Faculty of Engineering Design and Automation.

#### D. In-House Summer Internship:

- In-house summer internship is a core course, to be done typically during the summer vacations. A student should undergo summer internship for 4 weeks, starting after year 1<sup>st</sup>, in the campus. Training of 2<sup>nd</sup> semester shall be graded and is essential part of the degree requirement in 3<sup>rd</sup> semester.
- Each Faculty shall nominate training coordinator from amongst the faculty members. The faculty will scrutinize the training report and will award a marks, which must be sent to the controller of examination office. The summer internship, submission of training report and obtaining pass grade is mandatory requirement for award of B.Tech Civil Engineering degree.

#### E. Major Project:

A major project shall be a multifaceted assignment that serves as a culminating academic and intellectual experience for students, typically during their final year at the University. Major projects may take a wide variety of forms, but they shall be Semester long investigative projects that culminate in a final product, presentation, or performance. In projects under the guidance of a faculty member, a final year student is required to do some innovative work with application of knowledge earned while undergoing various courses and labs in the earlier years. The student is expected to do literature survey and carry out development and/or experimentation. Through the project work the student must exhibit both the analytical and practical skills. The student will have to do his/her project under the guidance of the faculty member from the same department unless specifically permitted by the Head of the Department for alternate arrangements.

## B.TECH COMPUTER SCIENCE AND ENGINEERING.

### A. Program Outcomes:

- PO1 Engineering knowledge:** Apply the knowledge of Mathematics, Science, Engineering Fundamentals, and an Engineering specialization to the solution of complex engineering problems.
- PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 Design/development of solutions:** 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.
- PO4 Conduct investigations of complex problems:** 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.
- PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- PO6 The engineer and society:** 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.
- PO7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge, and need for sustainable development.
- PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 Communication:** 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.

- PO11 Project management and finance:** 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.
- PO12 Life-long learning:** 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.

### B. Program Specific Outcomes:

By the completion of Computer Science program the student will have following Program specific outcomes.

- PSO1 Foundation of Computer System:** Ability to understand the principles and working of computer systems. Students can assess the hardware and software aspects of computer systems.
- PSO2 Foundations of Software development:** Ability to understand the structure and development methodologies of software systems. Possess professional skills and knowledge of software design process. Familiarity and practical competence with a broad range of programming language and open source platforms.
- PSO3 Foundation of basic Sciences:** Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm.
- PSO4 Applications of Computing and Entrepreneurship Ability:** Ability to use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.

## C. Program Structure: As per GNA University.

## Details of Courses under B.TECH (COMPUTER SCIENCE AND ENGINEERING)

S. No	Course	Theory (A)	Theory & Tutorial (B)	Practical (C)	Practical/ Training (D)	Total
2	<b>Engineering Science Courses(ESC)</b> (1 Paper of 4 credits) (2 Papers of 2.5 credits each) (5 Papers of 4 credits each) (3 Papers of 1 credit each) (2 Papers of 2 credits each) (1 Paper of 3 credits)	2x3=06	1x4=04	2x3=06	3x1=3 2x2=4	23
3	<b>Humanities and Social Science Including Management Courses (HSMC)</b> (2 Papers of 2 credits each) (3 Papers of 3 credits each) (2 Papers of 1 credit each)2x2=04 3x3=09	2x2=04 3x3=09	NIL	NIL	2x1=02	15
4	<b>Professional Core Courses(PCC)</b> (13 Papers of 3 credits each) (1 paper of 4 credit) (5 Papers 2 Credits each) (4 Papers of 1 credit each)	12x3=36	1x4=4	NIL	5x2=10 4x1=04	54
5	<b>Professional Elective Courses(PEC)</b> (8 Papers of 3 credits each) (2 Papers of 1 credit each) (1 Paper of 2 credits)	8x3=24	NIL	NIL	2x1=02 1x2=02	28
6	<b>Open Elective Courses(OEC)</b> (4 Papers of 3 credits each)	4x3=12	NIL	NIL	NIL	12
7	<b>Mandatory Courses(MC)</b> (2 papers of 0 Credit each)	NIL	NIL	NIL	NIL	NIL
8	<b>Project (PROJ)</b> (2 Paper of 2 credits) (2 Papers of 6 credits each) (1 Paper of 0 Credit)	NIL	NIL	NIL	2x2=04 2x6=12	16
<b>Total Credits</b>		<b>91(A)</b>	<b>28(B)</b>	<b>08©</b>	<b>43(D)</b>	<b>170</b>

## Semester I (First year) A

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
		*BTM102	Mathematics – I							
3	Engineering Science course	BCS 101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME101	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS 121	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	English Communication Lab	0	0	2	30	20	50	1
10	Mandatory courses	BMC001	Environmental Science	2	0	0	40	0	40	S/US (Non-Credit)
<b>Total</b>				<b>14</b>	<b>2</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>21</b>

\*The course Mathematics - I (BTM102) is offered in B. Tech. Computer Science and Engineering only.

**Semester I (First year) A**

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
		*BTM102	Mathematics-I							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME101	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	Business Communication Lab	0	0	2	30	20	50	1
10	Mandatory Courses	BMC001	Environmental Science	2	0	0	40	0	40	S/US (Non-Credit)
<b>Total</b>				<b>14</b>	<b>3</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>22</b>

\* The course Engineering Physics (BTP101) and Engineering Physics Laboratory (BTP121) are offered to B.Tech. Mechanical, Civil, and Aerospace Engineering

\*\*The course Semiconductor Physics (BTP102) and Semiconductor Physics Laboratory (BTP122) are offered to B.Tech. Electronics and communication, Mechatronics, Mechanical and Automation, Robotics and Automation Engineering, and Computer Science Engineering

\*The course Mathematics – I (BTM102) is offered in B. Tech. Computer Science and Engineering only.

**Semester II (First year) GROUP A**

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics – II							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME201	Engineering Drawing and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM201	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>3</b>	<b>13</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>22</b>

\* The course Engineering Physics (BTP101) and Engineering Physics Laboratory (BTP121) are offered to B.Tech. Mechanical, Civil, and Aerospace Engineering

\*\*The course Semiconductor Physics (BTP102) and Semiconductor Physics Laboratory (BTP122) are offered to B.Tech. Electronics and communication, Mechatronics, Mechanical and Automation, Robotics and Automation Engineering, and Computer Science Engineering

\*The course Mathematics – I (BTM102) is offered in B. Tech. Computer Science and Engineering only.

Note: There shall be a summer training of 4 weeks duration at the end of 2nd semester.

The assessment this will be included in the 3rd semester.



## Semester II (First year) -GROUP-B

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics-II							
3	Engineering Science course	BCS101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME201	Engineering Drawing and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM201	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS122	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>2</b>	<b>13</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>21</b>

\*The course Mathematics - I (BTM102) is offered in B. Tech. Computer Science and Engineering only.

Note: There shall be a summer training of 4 weeks duration at the end of 2nd semester.

The assessment this will be included in the 3rd semester.

## Semester III (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BCS301	Data structure & Algorithms	3	0	0	40	60	100	3
2	Professional Core Courses	BCS302	Object Oriented Programming using C++	3	0	0	40	60	100	3
3	Professional Core Courses	BCS303	Computer Organization & Architecture	3	0	0	40	60	100	3
4	Basic Science Course	BTM302	Mathematics-III	3	1	0	40	60	100	4
5	Humanities & Social Sciences including Management courses	LAE001	Law and Engineering	3	0	0	40	60	100	3
6	Professional Core Courses	BCS321	Data structure & Algorithms Laboratory	0	0	4	30	20	50	2
7	Professional Core Courses	BCS322	Object Oriented Programming using C++ Laboratory	0	0	4	30	20	50	2
8	PROJ	BCS300	Summer Internship*	-	-	-	40	-	40	S/US
<b>Total</b>				<b>15</b>	<b>1</b>	<b>8</b>	<b>300</b>	<b>340</b>	<b>640</b>	<b>20</b>

\* Students will take 4 weeks in- house Summer Internship after 2<sup>nd</sup> semester

## Semester IV (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BCS401	Operating Systems	3	0	0	40	60	100	3
2	Professional Core Courses	BCS402	JAVA Programming	3	0	0	40	60	100	3
3	Engineering Science course	BEE302	Digital Circuit and Logical Design	3	0	0	40	60	100	3
4	Professional Core Courses	BTM402	Discrete Mathematics	3	1	0	40	60	100	4
5	Humanities & Social Sciences including Management courses	DOS001	Development of Societies/Philosophy	3	0	0	40	60	100	3
6	Professional Core Courses	BCS421	Operating Systems Laboratory	0	0	4	30	20	50	2
7	Professional Core Courses	BCS422	JAVA Programming Laboratory	0	0	4	30	20	50	2
8	Engineering Science course	BEE322	Digital Circuit and Logical Design Laboratory	0	0	2	30	20	50	1
<b>Total</b>				<b>15</b>	<b>1</b>	<b>10</b>	<b>330</b>	<b>360</b>	<b>690</b>	<b>21</b>

## Semester V (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BCS501	Computer Networks	3	0	0	40	60	100	3
2	Professional Core Courses	BCS502	Database Management Systems	3	0	0	40	60	100	3
3	Professional Core Courses	BCS503	Formal Language & Automata Theory	3	0	0	40	60	100	3
4	Professional Core Courses	BCS504	Web Technologies	3	0	0	40	60	100	3
5	Humanities & Social Sciences including Management courses	HVE001	Universal Human Values	3	0	0	40	60	100	3
6	Professional Elective Courses	BCS***	Elective – I	3	0	0	40	60	100	3
7	Mandatory Courses	BMC001	Constitution of India	2	0	0	40	-	40	S/US
8	Professional Core Courses	BCS521	Computer Networks Laboratory	0	0	2	30	20	50	1
9	Professional Core Courses	BCS522	Database Management Systems Laboratory	0	0	4	30	20	50	2
10	Professional Core Courses	BCS523	Web Technologies Laboratory	0	0	2	40	60	100	1
11	Professional Elective Courses	BCS***	Elective – I Laboratory	0	0	2	30	20	50	1
12	PROJ	BCS500	Summer Internship*	-	-	-	50	50	100	2
<b>Total</b>				<b>20</b>	<b>0</b>	<b>10</b>	<b>460</b>	<b>530</b>	<b>990</b>	<b>25</b>

\* Students will take 6-8 weeks Summer Internship in-house/ Industry after 4<sup>th</sup> semester

## Semester VI (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BCS601	Compiler Design	3	0	0	40	60	100	3
2	Professional Elective Courses	BCS602	Software Engineering	3	0	0	40	60	100	3
3	Professional Elective Courses	BCS603	Design and Analysis of Algorithms	3	0	0	40	60	100	3
4	Professional Core Courses	BCS604	Computer Graphics	3	0	0	40	60	100	3
5	Professional Elective Courses	BCS***	Elective – II	3	0	0	40	60	100	3
6	Professional Elective Courses	BCS***	Elective – III	3	0	0	40	60	100	3
7	Open Elective Courses	*****	Open Elective – I (Humanities)	3	0	0	40	60	100	3
8	Professional Core Courses	BCS621	Compiler Design Laboratory	0	0	2	30	20	50	1
9	Professional Elective Courses	BCS622	Software Engineering Laboratory	0	0	2	30	20	50	1
10	Professional Elective Courses	BCS623	Design and Analysis of Algorithms Laboratory	0	0	4	30	20	50	2
11	Professional Core Courses	BCS624	Computer Graphics Laboratory	0	0	2	30	20	50	1
<b>Total</b>				<b>21</b>	<b>0</b>	<b>10</b>	<b>400</b>	<b>500</b>	<b>900</b>	<b>26</b>

## Semester VII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BCS701	Artificial Intelligence	3	0	0	40	60	100	3
2	Professional Elective Courses	BCS***	Elective – IV	3	0	0	40	60	100	3
3	Professional Elective Courses	BCS***	Elective – V	3	0	0	40	60	100	3
4	Open Elective Courses	BCS***	Open Elective – II	3	0	0	40	60	100	3
5	PROJ	BCS721	Minor Project	0	0	12	50	50	100	6
6	PROJ	BCS700	Summer Internship*	-	-	0	50	50	100	2
<b>Total</b>				<b>12</b>	<b>0</b>	<b>12</b>	<b>260</b>	<b>340</b>	<b>600</b>	<b>20</b>

\* Students will take minimum of 4 weeks summer Internship in Industry after 6<sup>th</sup> semester

## Semester VIII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Elective Courses	BCS***	Elective – VI	3	0	0	40	60	100	3
2	Open Elective Courses	BCS***	Open Elective – III	3	0	0	40	60	100	3
3	Open Elective Courses	BCS***	Open Elective – IV	3	0	0	40	60	100	3
4	PROJ	BCS821	Major Project	0	0	12	50	50	100	6
<b>Total</b>				<b>9</b>	<b>0</b>	<b>12</b>	<b>170</b>	<b>230</b>	<b>400</b>	<b>15</b>

**\*Elective –I**

Course Code	Course Title
BCS541	Python Programming
BCS542	Linux & Shell Programming
BCS543	Dot Net Technologies
BCS544	R Programming
BCS523	Python Programming Laboratory
BCS524	Linux and Shell Programming Laboratory
BCS525	Dot Net Technologies Laboratory
BCS526	R Programming Laboratory

**\*\*Elective –II**

Pre-requisites	Course Code	Course Title
BCS501	BCS641	Principles of Mobile Communication
N.A.	BCS642	Big data
BCS502	BCS643	Advanced Databases
N.A.	BCS644	Cloud Computing and Virtualization
BCS501	BCS645	Ethical Hacking

**\*\*\*Elective – III**

Pre-requisites	Course Code	Course Title
BCS501	BCS646	Wireless Sensor Networks
BCS502	BCS647	Data Warehousing and Mining
N.A.	BCS648	Cloud Architecture and Deployment Model
N.A.	BCS649	Knowledge Based Decision Support System
N.A.	BCS650	Information Security and Network Security

**\*\*\*\*Elective –IV**

Pre-requisites	Course Code	Course Title
BCS641	BCS741	Principles of Mobile Computing
BCS645, BCS650	BCS742	Cyber Crime Investigation and Digital Forensics
BCS642, BCS647	BCS743	Distributed Database Systems
BCS649	BCS744	Machine Learning
BCS644, BCS648	BCS745	Cloud Security and Management

**\*\*\*\*\*Elective – V**

Pre-requisites	Course Code	Course Title
BCS603	BCS746	Mobile Application Development
BCS645, BCS650	BCS747	Intrusion Detection System
BCS644, BCS648	BCS748	Application Development in Cloud
BCS647	BCS749	Graph Analytics for Big Data
BCS642, BCS647	BCS750	Big Data Modeling and Management Systems

**\*\*\*\*\*Elective – VI**

Pre-requisites	Course Code	Course Title
BCS746	BCS841	Mobile Security
BCS747	BCS842	Applied Cryptography
BCS748	BCS843	Cloud Performance Tuning
BCS749	BCS844	Mobile Databases
BCS750	BCS845	Business Intelligence

## Open Elective –I

Course Code	Course Title
QMD031	Quantitative methods for decision making
VAE031	Values and Ethics
EPI031	Economic Policies in India
FME031	Fundamentals of Management for Engineers

**D. In-House Summer Internship:**

- In-house summer internship is a core course, to be done typically during the summer vacations. A student should undergo summer internship for 4 weeks, starting after year 1<sup>st</sup>, in the campus. Training of 2<sup>nd</sup> semester shall be graded and is essential part of the degree requirement in 3<sup>rd</sup> semester.
- Each Faculty shall nominate training coordinator from amongst the faculty members. The faculty will scrutinize the training report and will award marks, which must be sent to the controller of examination office. The summer internship, submission of training report and obtaining pass grade is mandatory requirement for award of B.Tech Computer Science & Engineering degree.

**E. Industrial Training:**

A student should undergo industrial training for 6-8 weeks, starting after semester 4<sup>th</sup> and 6<sup>th</sup>, preferably in an industry, R & D institutions or in an academic institution of repute permitted. Training of 4<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 5<sup>th</sup> semester and training of 6<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 7<sup>th</sup> semester. This industrial training program is compulsory and an integral part of the Program. The Placement Officer will assist the students in finding suitable training assignments / projects.

The industrial training aims at achieving the following objectives:

- (i) Application of knowledge and techniques learnt in the first and second year to real life situation and make them better prepared to enrich their learning in the upcoming semesters.
- (ii) Appreciating the inter-linkage among different functions and developing a realistic perspective about organizations in their totality. The students should take the industrial training seriously. They are expected to diligently in the job. A faculty member will work closely with the company to define the scope of the industrial

training and ensure proper understanding of the terms of engagement by all concerned.

The student should be ready to not only learn from the followed practices in the Industry but also present a professional front i.e. being punctual at the workplace, well behaved and appropriately dressed. At the end of the training, the student should submit a brief report explaining briefly the key learning points and the insights gained. A 'certificate of completion' from the host organization is essential. The Industry training shall be credited as approved in the curricula. The industrial training, submission of training report and obtaining pass grade is mandatory requirement for award of B.Tech. Computer Science and Engineering degree.

**F. Major Project:** A major project shall be a multifaceted assignment that serves as a culminating academic and intellectual experience for students, typically during their final year at the University. Major projects may take a wide variety of forms, but they shall be Semester long investigative projects that culminate in a final product, presentation, or performance. In projects under the guidance of a faculty member, a final year student is required to do some innovative work with application of knowledge earned while undergoing various courses and labs in the earlier years. The student is expected to do literature survey and carry out development and/or experimentation. Through the project work the student must exhibit both the analytical and practical skills. The student will have to do his/her project under the guidance of the faculty member from the same department unless specifically permitted by the Head of the Department for alternate arrangements.

## B. TECH. MECHANICAL ENGINEERING.

### A. Program Outcomes:

- **PO1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO3 Design/development of solutions:** 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.
- **PO4 Conduct investigations of complex problems:** 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.
- **PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- **PO6 The engineer and society:** 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.
- **PO7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge, and need for sustainable development.
- **PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10 Communication:** 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.

- PO11 Project management and finance:** 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.
- PO12 Life-long learning:** 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.

#### B. Program Specific Outcomes:

- PSO1** Graduates will analyze, design and develop machining systems to solve the engineering problems by integrating thermal design and manufacturing domains of mechanical engineering.
- PSO2** Graduates will adopt a multidisciplinary approach to solve real world industrial problems.
- PSO3** Graduates will adopt a multidisciplinary approach to solve real world industrial problems.

#### C. Program Structure: As per GNA University.

##### Details of Courses under B.Tech Mechanical Engineering

S. No	Course Category	Theory	Theory & Tutorial	Practical	Theory & Practical	Total Credits
1	BSC	NIL	5*4=20	2*1=2	NIL	22
2	ESC	2*3=6	1*4=4	3*1=3 2*2=4	2*3=6	23
3	HSMC	2*3=6 2*2=4	NIL	2*1=2	NIL	12
4	PCC	6*3=18	7*4=28 1*5=5	11*1=11	NIL	62
5	PEC	6*3=18	NIL	NIL	NIL	18
6	OEC	5*3=15	NIL	NIL	NIL	15
7	MC	2*0=0	NIL	NIL	NIL	0
8	PROJ	NIL	NIL	1*2 = 2 1*1 = 1 1*4 = 4 1*8 = 8 1*0 = 0	NIL	15
9	LC	25 courses of 37 credit				----
<b>Total Credits</b>		<b>67</b>	<b>57</b>	<b>37</b>	<b>6</b>	<b>167</b>

#### Program Structure: B.Tech. Mechanical Engineering Semester I (First year) - GROUP-A

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
		*BTM102	Mathematics – I							
3	Engineering Science course	BCS 101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME101	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS 121	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	English Communication Lab	0	0	2	30	20	50	1
10	Mandatory courses	BMC001	Environmental Science	2	0	0	40	0	40	S/US (Non-Credit)
<b>Total</b>				<b>14</b>	<b>2</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>21</b>

\*The course Mathematics - I (BTM102) is offered in B. Tech. Computer Science and Engineering only.

## Semester I (First year) - GROUP-B

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
		*BTM102	Mathematics-I							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME101	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	English Communication Lab	0	0	2	30	20	50	1
10	Mandatory Courses	BMC001	Environmental Science	2	0	0	40	0	40	S/US (Non-Credit)
<b>Total</b>				<b>14</b>	<b>3</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>22</b>

\* The Course Engineering Physics (BTP101) and Engineering Physics Laboratory (BTP121) are offered to B. Tech Mechanical, Civil, Aerospace, Electronics and Communication & Mechatronics Engineering)

\*\*The Course Semiconductor Physics (BTP102) and Semiconductor Physics Laboratory (BTP122) are offered to B. Tech Computer Science Engineering, B.Tech. Mechanical and Automation Engineering and B.Tech. Robotics and Automation Engineering)

\*The course Mathematics – I (BTM102) is offered in B. Tech. Computer Science and Engineering only.

## Semester II (First year) -GROUP-A

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics – II							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME201	Engineering Drawing and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM201	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>3</b>	<b>13</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>22</b>

\* The Course Engineering Physics (BTP101) and Engineering Physics Laboratory (BTP121) are offered to B. Tech Mechanical, Civil, Aerospace, Electronics and Communication & Mechatronics Engineering)

\*\*The Course Semiconductor Physics (BTP102) and Semiconductor Physics Laboratory (BTP122) are offered to B. Tech Computer Science Engineering, B.Tech. Mechanical and Automation Engineering and B.Tech. Robotics and Automation Engineering)

\*The course Mathematics - II (BTM202) is offered in B. Tech Computer Science and Engineering only.

**Note: There shall be a summer training of 4 weeks duration at the end of 2<sup>nd</sup> semester. The assessment for this will be included in the 3<sup>rd</sup> semester.**



## Semester II (First year) -GROUP-B

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics – II							
3	Engineering Science course	BCS 101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME201	Engineering and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM201	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS 121	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>2</b>	<b>13</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>21</b>

\*The course Mathematics - II (BTM202) is offered in B. Tech. Computer Science and Engineering only.

**Note: There shall be a summer training of 4 weeks duration at the end of 2<sup>nd</sup> semester. The assessment for this will be included in the 3<sup>rd</sup> semester.**

## Semester III (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BAE301	Strength of Materials	3	1	0	40	60	100	4
2	Professional Core Courses	BAE302	Theory of Machines	3	1	0	40	60	100	4
3	Professional Core Courses	BME303	Materials Engineering	3	0	0	40	60	100	3
4	Engineering Science Course	BME302	Engineering Thermodynamics	3	0	0	40	60	100	3
5	Professional Core Courses	BME301	Strength of Materials Laboratory	0	0	2	30	20	50	1
6	Professional Core Courses	BMC001	Theory of Machines Laboratory	0	0	2	30	20	50	1
7	Engineering Science Course	BAE300	Materials Engineering Lab	0	0	2	30	20	50	1
8	Mandatory Courses	BME322	Constitution of India	2	0	0	40	0	40	S/US (Non Credit)
9	Open Elective Courses		Open Elective-I	3	0	0	40	60	100	3
10			HONOUR ELECTIVE/ MINOR ELECTIVE							
11	Summer Training		Summer Training*	-	-	-	40	-	40	S/US (Non Credit)
<b>Total</b>				<b>17</b>	<b>2</b>	<b>8</b>	<b>370</b>	<b>360</b>	<b>730</b>	<b>20</b>

**\*Summer Training will be imparted internally at the end of 2<sup>nd</sup> semester for four (04) weeks duration**

## Semester IV (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BME401	Applied Thermodynamics	3	1	0	40	60	100	4
2	Professional Core Courses	BME402	Fluid Mechanics	3	1	0	40	60	100	4
3	Professional Core Courses	BME403	Solid Mechanics	3	1	0	40	60	100	4
4	Basic Science course	BTM301	Transform & Discrete Mathematics	3	1	0	40	60	100	4
5	Humanities & Social Sciences including Management courses	HVE001	Human Values and Professional Ethics	3	0	0	40	60	100	3
6	Professional Core Courses	BME421	Applied Thermodynamics Laboratory	0	0	2	30	20	50	1
7	Professional Core Courses	BME422	Fluid Mechanics Laboratory	0	0	2	30	20	50	1
8	Open Elective Courses		Open Elective-II	3	0	0	40	60	100	3
9			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>18</b>	<b>4</b>	<b>4</b>	<b>300</b>	<b>400</b>	<b>700</b>	<b>24</b>

\*Note: There shall be an industrial training of six (06) weeks duration at the end of 4<sup>th</sup> semester.

The credits earned for this will be included in the 5<sup>th</sup> semester.

## Semester V (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BME501	Heat Transfer	3	1	0	40	60	100	4
2	Professional Core Courses	BME502	Fluid Machinery	3	1	0	40	60	100	4
3	Professional Core Courses	BME503	Manufacturing Processes	3	0	0	40	60	100	3
4	Humanities & Social Sciences including Management courses	OPR001	Operations Research	3	0	0	40	60	100	3
5	PROJ	BME500	Industrial Training	0	0	0	50	50	100	2
6	Professional Core Courses	BME521	Heat Transfer Laboratory	0	0	2	30	20	50	1
7	Professional Core Courses	BME522	Fluid Machinery Laboratory	0	0	2	30	20	50	1
8	Professional Core Courses	BME523	Manufacturing Processes Laboratory	0	0	2	30	20	50	1
9	Open Elective Courses		Open Elective-III	3	0	0	40	60	100	3
10			HONOR ELECTIVE 1/ MINOR ELECTIVE 1							
<b>Total</b>				<b>15</b>	<b>2</b>	<b>6</b>	<b>340</b>	<b>410</b>	<b>750</b>	<b>22</b>

## Semester VI (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BME601	Automation in Manufacturing	3	0	0	40	60	100	3
2	Professional Core Courses	BME602	Industrial Instrumentation and Metrology	3	0	0	40	60	100	3
3	Professional Core Courses	BME603	Machine Design	3	2	0	40	60	100	5
4	Professional Core Courses	BME*	Elective – I	3	0	0	40	60	100	3
5	Professional Core Courses	BME*	Elective – II	3	0	0	40	60	100	3
6	PROJ	BME600	Minor Project	0	0	2	50	50	100	1
7	Professional Core Courses	BME621	Automation in Manufacturing Lab	0	0	2	30	20	50	1
8	Professional Core Courses	BME622	Industrial Instrumentation and Metrology Lab	0	0	2	30	20	50	1
9			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>15</b>	<b>2</b>	<b>6</b>	<b>310</b>	<b>390</b>	<b>700</b>	<b>20</b>

**Note: The students are required to undergo industrial / software training for minimum of four (04) weeks duration at the end of 6<sup>th</sup> semester. The assessment for the same will be done in the 7<sup>th</sup> semester.**

## Semester VII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Elective Courses	BME701	Mechanical Vibrations	3	0	0	40	60	100	3
2	Professional Elective Courses	BME**	Elective – III	3	0	0	40	60	100	3
3	Professional Elective Courses	BME**	Elective – IV	3	0	0	40	60	100	3
4	Professional Core Courses	BME721	Mechanical Vibrations Laboratory	0	0	2	30	20	50	1
5	PROJECT	BME700	Major Project	0	0	8	50	50	100	4
6	Open Elective Courses		Open Elective – IV	3	0	0	40	60	100	3
7	PROJECT	BMEI700	Industrial/Software Training	0	0	0	30	20	50	S/US (Non-Credit)
8			HONOR ELECTIVE 1/ MINOR ELECTIVE 1							
<b>Total</b>				<b>12</b>	<b>0</b>	<b>10</b>	<b>240</b>	<b>310</b>	<b>550</b>	<b>17</b>

**Note: The students are required to undergo industrial / software training for minimum of four (04) weeks duration at the end of 6<sup>th</sup> semester. The assessment for the same will be done in the 7<sup>th</sup> semester.**

## Semester VIII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BME801	Refrigeration and Air Conditioning	3	0	0	40	60	100	3
2	Professional Elective Courses	BME***	Elective – V	3	0	0	40	60	100	3
3	Professional Elective Courses	BME***	Elective – VI	3	0	0	40	60	100	3
4	Open Elective Courses		Open Elective – V	3	0	0	40	60	100	3
5	PROJECT	BME800	Industrial Defined Project	0	0	16	50	50	100	8
6	Professional Core Courses	BME821	Refrigeration and Air Conditioning Laboratory	0	0	2	30	20	50	1
7			HONOR ELECTIVE 1/ MINOR ELECTIVE 1							
<b>Total</b>				<b>12</b>	<b>0</b>	<b>18</b>	<b>240</b>	<b>310</b>	<b>550</b>	<b>21</b>

## LIST OF PROFESSIONAL ELECTIVES COURSES

## \*Elective –I and II

Course Code	Course Title
BME641	Internal Combustion Engines
BME642	Non-Conventional Energy Sources
BME643	Composite Materials
BME644	Tribology
BME645	Advanced Machining Processes
BME646	Lean Manufacturing
BME647	Production Planning and Control
BME648	Industrial Automation and Robotics
BME649	Microprocessor in Automation

## \*\*Elective –III &amp; IV

Course Code	Course Title
BME741	Power Plant Engineering
BME742	Advanced Metal Cutting
BME743	Metal Forming
BME744	Micro and Nano Manufacturing
BME745	Industrial Engineering and Management
BME746	Project Management
BME747	Fluid Power Systems
BME74	Hydrogen and Fuel Cells
8BME749	Total Productive Maintenance

## \*\*\*Elective –V &amp; VI

Course Code	Course Title
BME841	Automobile Engineering
BME842	Additive Manufacturing
BME843	Solar Thermal Power Energy
BME844	Non-Destructive Testing
BME845	Tool Design
BME846	Nanotechnology
BME847	Automotive Electronic and Instrumentation Systems
BME848	Product Design and Development
BME849	Automotive Aerodynamics

Course Code	Course Title	L	T	P	Cr
BME031	Electric and Hybrid Vehicle	3	0	0	3
BME032	Industrial Ergonomics	3	0	0	3
BME033	Introduction to Hydraulics and Pneumatics	3	0	0	3
BME034	Basic Thermodynamics and Heat Transfer	3	0	0	3
BME035	Energy Conservation	3	0	0	3
BME036	Solar Energy Utilization	3	0	0	3
BME037	Material Handling System	3	0	0	3
BME038	Production and Operation management	3	0	0	3
BME039	Safety and Hazard Analysis	3	0	0	3
BMA031	Entrepreneurship	3	0	0	3
BMA032	Operations Management	3	0	0	3
BMA033	Management Information System	3	0	0	3
BMA034	Basics of CAD	2	0	2	3
BMA035	Basics of Additive Manufacturing	2	0	2	3
BEE031	Simulation and Modelling	1	0	4	3
BEE032	Industrial Robotics and control	3	0	0	3
BEE033	Network Securities	3	0	0	3
BEE034	Artificial Intelligence	3	0	0	3
BEE035	PLC and SCADA	3	0	0	3
BEE036	Internet of Things	3	0	0	3
BEE037	Biomedical Instrumentation	3	0	0	3
BEE038	Nanoelectronics	3	0	0	3
BEE039	Composite Materials				
BAE031	Introduction to Aerospace Engineering	3	0	0	3
BAE032	Aircraft Materials	3	0	0	3
QMD031	Quantitative methods for decision making	3	0	0	3
VAE 031	Values and Ethics	3	0	0	3
EPI 031	Economic Policies in India	3	0	0	3
FME 031	Fundamentals of Management for Engineers	3	0	0	3
BCS041	Basics of Python Programming	2	0	2	3
BCS042	Introduction to Linux and Shell Programming	2	0	2	3
BCS 043	Basics of Web Technologies	2	0	2	3
BCE031	Water pollution and its management	3	0	0	3
BCE032	Global warming and Climate Change	3	0	0	3
BCE033	Disaster Management and Mitigation	3	0	0	3
BCE034	Soil Chemistry and its impact	3	0	0	3
BCE035	Energy engineering technological and management	3	0	0	3
BCE036	Renewable energy technology	3	0	0	3
BCE037	Industrial pollution prevention and control	3	0	0	3
BCE038	Numerical methods of Engineering	3	0	0	3

**LIST OF COURSES FOR ADDITIONAL MINOR ENGINEERING**

In order to have an additional Minor Engineering in Mechanical, a student has to earn additional minimum credits in the range of 18 to 20 either from the following courses or through MOOCs/NPTEL courses subject to the approval of the Dean/Head of the Faculty of Engineering Design and Automation.

Sr. No.	Semester	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	4 <sup>th</sup>	BME404	Elements of Mechanical Engineering	3	0	0	40	60	100	3
	4 <sup>th</sup>	BME424	Mechanical Engineering Lab	0	0	2	30	20	50	1
2	5 <sup>th</sup>	BME503	Manufacturing Processes	3	0	0	40	60	100	3
	5 <sup>th</sup>	BME523	Manufacturing Processes Laboratory	0	1	2	30	20	50	1
3	6 <sup>th</sup>	BME602	Industrial Instrumentation and Metrology	3	0	0	40	60	100	3
	6 <sup>th</sup>	BME622	Industrial Instrumentation and Metrology Laboratory	0	0	2	30	20	50	1
4	7 <sup>th</sup>	BME501	Automobile Engineering	3	0	0	40	60	100	3
	7 <sup>th</sup>	BME521	Automobile Engineering Laboratory	0	0	2	30	20	50	1
5	8 <sup>th</sup>	BME801	Refrigeration and Air-Conditioning	3	0	0	40	60	100	3
	8 <sup>th</sup>	BME821	Refrigeration and Air-Conditioning Laboratory	0	0	2	30	20	50	1

**FOR HONOURS DEGREE**

A student will be eligible to get B. Tech Mechanical Engineering with Honours, if he/she earns additional credits in the range of 18 to 22 credits. These credits could be acquired through MOOCs/NPTEL/class room teaching subject to the approval of the Dean/Head of the Faculty of Engineering Design and Automation.

**D. In-House Summer Internship:**

- In-house summer internship is a core course, to be done typically during the summer vacations. A student should undergo summer internship for 4 weeks, starting after year 1<sup>st</sup>, in the campus. Training of 2<sup>nd</sup> semester shall be graded and is essential part of the degree requirement in 3<sup>rd</sup> semester.
- Each Faculty shall nominate training coordinator from amongst the faculty members. The faculty will scrutinize the training report and will award marks, which must be sent to the controller of examination office. Mechanical Engineering. The summer internship, submission of training report and obtaining pass grade is mandatory requirement for award of B.Tech Mechanical Engineering degree.

**E. Industrial Training:**

A student should undergo industrial training for 6-8 weeks, starting after semester 4<sup>th</sup> and 6<sup>th</sup>, preferably in an industry, R & D institutions or in an academic institution of repute permitted. Training of 4<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 5<sup>th</sup> semester and training of 6<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 7<sup>th</sup> semester. This industrial training program is compulsory and an integral part of the Program. The Placement Officer will assist the students in finding suitable training assignments / projects.

The industrial training aims at achieving the following objectives:

- (a) Application of knowledge and techniques learnt in the first and second year to real life situation and make them better prepared to enrich their learning in the

upcoming semesters.

(b) Appreciating the inter-linkage among different functions and developing a realistic perspective about organizations in their totality. The students should take the industrial training seriously. They are expected to diligently in the job. A faculty member will work closely with the company to define the scope of the industrial training and ensure proper understanding of the terms of engagement by all concerned. The student should be ready to not only learn from the followed practices in the Industry but also present a professional front i.e. being punctual at the workplace, well behaved and appropriately dressed. At the end of the training, the student should submit a brief report explaining briefly the key learning points and the insights gained. A 'certificate of completion' from the host organization is essential. The Industry training shall be credited as approved in the curricula. The industrial training, submission of training report and obtaining pass grade is mandatory requirement for award of B.Tech Mechanical Engineering degree.

**F. Major Project:** A major project shall be a multifaceted assignment that serves as a culminating academic and intellectual experience for students, typically during their final year at the University. Major projects may take a wide variety of forms, but they shall be Semester long investigative projects that culminate in a final product, presentation, or performance. In projects under the guidance of a faculty member, a final year student is required to do some innovative work with application of knowledge earned while undergoing various courses and labs in the earlier years. The student is expected to do literature survey and carry out development and/or experimentation. Through the project work the student must exhibit both the analytical and practical skills. The student will have to do his/her project under the guidance of the faculty member from the same department unless specifically permitted by the Head of the Department for alternate arrangements.

## B. TECH – ELECTRONICS & COMMUNICATION ENGINEERING.

### A. Program Outcomes:

- **PO1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO3 Design/development of solutions:** 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.
- **PO4 Conduct investigations of complex problems:** 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.
- **PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- **PO6 The engineer and society:** 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.
- **PO7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge, and need for sustainable development.
- **PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10 Communication:** 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.

- PO11 Project management and finance:** 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.
- PO12 Life-long learning:** 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.

#### B. Program Specific Outcomes:

- PSO1** Apply principles of Engineering Mathematics, Physics and core engineering including applications appropriate to the ECE. Also select and apply cutting-edge engineering hardware and software tools to solve complex ECE problems. Apply the fundamental concepts of ECE to design a variety of components and systems for applications including signal processing, image processing, communication, networking, embedded systems, VLSI & control system.
- PSO2** The ability to absorb and apply fundamental knowledge of core electronics and communication engineering subjects in the analysis, design and development of various types of integrated electronics systems as well as to interpret & synthesize the experimental data leading to valid conclusions.
- PSO3** Excellent adaptability to changing work environment, good interpersonal skills as a leader in a team in appreciation of professional ethics & societal responsibilities.
- PSO4** Specify, design, prototype and test electronic systems that perform analog and digital processing functions as per user requirements. Also various architect, partition, and select appropriate technologies for implementation of specified wired and wireless communication systems.

#### C. Program Structure: As per GNA University.

##### Details of Courses under B.Tech Electronics & Communication Engineering

S. No	Course Category	Theory	Theory and Tutorial	Practical	Theory and Practical	Total Credits
1	Bsc	NIL	7X4=28	2X2=2	NIL	30
2	Esc	1X3=3	NIL	3X2=3 2X4=4	2X4=6	16
3	HSMC	2X3=6 2X2=4	NIL	1X2=1	NIL	11
4	PCC	7X3=21	4X4=16	9X2=9	NIL	46
5	PEC	8X3=24 1X1=1	NIL	1X4=2	NIL	27
6	OEC	6X3=18	NIL	NIL	NIL	18
7	LC	<b>25 courses of 37 credit</b>				
8	MC	2X2=0	NIL	NIL	NIL	NIL
9	PROJ Summer Training		NIL	2X2=2 1X0=2 2X12=12		16
<b>Total Credits</b>		<b>77</b>	<b>44</b>	<b>37</b>	<b>6</b>	<b>164</b>

\*Minor variation is allowed as per need of the respective disciplines

Note: Subject X Hours = Credits



## Program Structure: B.Tech Electronics &amp; Communication Engineering

## Semester I (First year) - GROUP-A

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
		*BTM102	Mathematics – I							
3	Engineering Science course	BCS 101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME101	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS 121	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	English Communication Lab	0	0	2	30	20	50	1
10	Mandatory courses	BMC001	Environmental Science	2	0	0	40	0	40	0
<b>Total</b>				<b>14</b>	<b>2</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>21</b>

## Semester I (First year) -GROUP-B

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM201	Calculus and Linear Algebra	3	1	0	40	60	100	4
		*BTM102	Mathematics – I							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME201	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	English Communication Lab	0	0	2	30	20	50	1
10	Mandatory courses	BMC001	Environmental Science	2	0	0	40	0	40	0
<b>Total</b>				<b>12</b>	<b>3</b>	<b>13</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>22</b>

\* The Course Engineering Physics (BTP101) and Engineering Physics Laboratory (BTP121) are offered to B. Tech Mechanical, Civil, Aerospace, Electronics and Communication & Mechatronics Engineering)

\*\*The Course Semiconductor Physics (BTP102) and Semiconductor Physics Laboratory (BTP122) are offered to B. Tech Computer Science Engineering, B.Tech. Mechanical and Automation Engineering and B.Tech. Robotics and Automation Engineering)

\*The course Mathematics - II (BTM202) is offered in B. Tech Computer Science and Engineering only.

Note: There shall be a summer training of 4 weeks duration at the end of 2<sup>nd</sup> semester. The assessment for this will be included in the 3<sup>rd</sup> semester.

## Semester II (First year) -GROUP-A

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics-II							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME201	Engineering Drawing and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM201	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>3</b>	<b>13</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>22</b>

## Semester II (First year) -GROUP-B

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics-II							
3	Engineering Science course	BCS101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME201	Engineering Drawing and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM201	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS122	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>2</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>21</b>

\*The course Mathematics - II (BTM202) is offered in B. Tech. Computer Science and Engineering only.

Note: There shall be a summer training of 4 weeks duration at the end of 2<sup>nd</sup> semester. The assessment for this will be included in the 3<sup>rd</sup> semester.

## Semester III (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BEE301	Electronic Devices	3	1	0	40	60	100	4
2	Professional Core Courses	BEE302	Digital Electronics	3	0	0	40	60	100	3
3	Engineering Science Courses	BEE303	Analysis and Synthesis of Networks	3	1	0	40	60	100	4
4	Professional Core Courses	BEE304	Communication Signal and Systems	3	1	0	40	60	100	4
5	PROJECT	BEE300	Summer Training	0	0	0	40	0	40	S/US (Non-Credit)
6	Mandatory Courses	BMC001	Constitution Of India	2	0	0	40	0	40	S/US (Non-Credit)
7	Professional Core Courses	BEE321	Electronic Devices Lab	0	0	2	30	20	50	1
8	Professional Core Courses	BEE322	Digital Electronics Lab	0	0	2	30	20	50	1
9	Summer Training	BEE323	Analysis and Synthesis of Networks Lab	0	0	2	30	20	50	1
10			HONOUR ELECTIVE/ MINOR ELECTIVE							
<b>Total</b>				<b>14</b>	<b>3</b>	<b>6</b>	<b>330</b>	<b>300</b>	<b>630</b>	<b>18</b>

\*Summer Training will be imparted internally at the end of 2<sup>nd</sup> semester for four (04) weeks duration.

## Semester IV (Second year)

\*Note: There shall be an industrial training of six (06) weeks duration at the end of 4<sup>th</sup> semester.

The credits earned for this will be included in the 5<sup>th</sup> semester.

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BEE401	Analog Communication Systems	3	0	0	40	60	100	3
2	Professional Core Courses	BEE402	Analog Circuits	3	0	0	40	60	100	3
3	Professional Core Courses	BEE502	Electromagnetic Field Theory	3	1	0	40	60	100	4
4	Basic Science course	BTM301	Transform & Discrete Mathematics	3	1	0	40	60	100	4
5	Humanities & Social Sciences including Management courses	HVE001	Human Values and Professional Ethics	3	0	0	40	60	100	3
6	Professional Core Courses	****	Open Elective	3	0	0	40	60	100	3
7	Professional Core Courses	BEE421	Analog Communication Systems Laboratory	0	0	2	30	20	50	1
8	Open Elective Courses	BEE422	Analog Circuits Laboratory	0	0	2	30	20	50	1
9			HONOR ELECTIVE 1/ MINOR ELECTIVE 1							
<b>Total</b>				<b>18</b>	<b>2</b>	<b>4</b>	<b>300</b>	<b>400</b>	<b>700</b>	<b>22</b>

## Semester V (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BEE501	Digital Communication Systems	3	0	0	40	60	100	3
2	Professional Core Courses	BEE403	Control System Engineering	3	0	0	40	60	100	3
3	Professional Core Courses	BEE503	Digital Signal Processing	3	1	0	40	60	100	4
4	Professional Elective Courses	BEE***	ELECTIVE-I	1	0	0	40	60	100	1
5	Open Elective Courses	***	Open Elective	3	0	0	40	60	100	3
6	Professional Elective Courses	BEE***	ELECTIVE-I Lab	0	0	4	30	20	50	2
7	Professional Core Courses	BEE521	Digital Communication Systems Laboratory	0	0	2	30	20	50	1
8	Professional Core Courses	BEE523	Digital Signal Processing Laboratory	0	0	2	30	20	50	1
9	Professional Core Courses	BEE423	Control System Engineering Laboratory	0	0	2	30	20	50	1
10	PROJECT	BEE500	Industrial Training	0	0	0	50	50	100	2
11			HONOR ELECTIVE 1/ MINOR ELECTIVE 1							
<b>Total</b>				<b>13</b>	<b>1</b>	<b>10</b>	<b>370</b>	<b>430</b>	<b>800</b>	<b>21</b>

Elective Courses Elective -I	
BEE541	Introduction to Python Programming
BEE542	Introduction to R
BEE522	Introduction to Python Programming Laboratory
BEE524	Introduction to R Laboratory

## Semester VI (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BEE601	Microprocessors and Microcontrollers	3	0	0	40	60	100	3
2	Professional Elective Courses	BEE***	Elective – II	3	0	0	40	60	100	3
3	Professional Elective Courses	BEE***	Elective – II	3	0	0	40	60	100	3
4	Professional Elective Courses	BEE***	Elective – III	3	0	0	40	60	100	3
5	Open Elective Courses	*****	Open elective	3	0	0	40	60	100	3
6	Humanities & Social Sciences including Management courses	OPR001	Operations Research	3	0	0	40	60	100	3
7	PROJECT	BEE600	Project Synopsis	0	0	2	50	50	100	1
8	Professional Core Courses	BEE621	Microprocessors and Microcontrollers Laboratory	0	0	2	30	20	50	1
9			HONOR ELECTIVE 1/ MINOR ELECTIVE*							
<b>Total</b>				<b>18</b>	<b>0</b>	<b>4</b>	<b>320</b>	<b>430</b>	<b>750</b>	<b>20</b>

Elective Courses Elective –II & Elective -III	
BEE641	Information Theory and Coding
BEE642	Power Electronics
BEE643	Antenna and Wave Propagation
BEE644	Linear Integrated Circuits
BEE645	Communication Switching Systems

## Semester VII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BEE701	Electronics Measurements & Instrumentation	3	0	0	40	60	100	3
2	Professional Elective Courses	BEE***	ELECTIVE- IV	3	0	0	40	60	100	3
3	Professional Elective Courses	BEE***	ELECTIVE- V	3	0	0	40	60	100	3
4	Professional Elective Courses	BEE***	ELECTIVE- VI	3	0	0	40	60	100	3
5	Open Elective Courses	***	Open Elective	3	0	0	40	60	100	3
6	PROJECT	BEE700	Project-I	0	0	12	50	50	100	6
7	Professional Core Courses	BEE721	Electronics Measurements & Instrumentation Lab	0	0	2	30	20	50	1
8			HONOR ELECTIVE 1/ MINOR ELECTIVE 1							
<b>Total</b>				<b>15</b>	<b>0</b>	<b>14</b>	<b>280</b>	<b>370</b>	<b>650</b>	<b>22</b>

Elective Courses Elective –IV, Elective –V & Elective –VI	
BEE741	Robotics & Control
BEE742	Basics of Computer Networks
BEE743	Embedded Systems
BEE744	Microwave & Radar Engineering
BEE745	Mobile Telecommunication Networks
BEE746	Wireless Sensor Networks
BEE747	Principles of VLSI Design
BCA743	Network Security and Cryptography

## Semester VIII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Elective Courses	BEE***	Elective – VII	3	0	0	40	60	100	3
2	Professional Elective Courses	BEE***	Elective -VIII	3	0	0	40	60	100	3
3	Open Elective Courses	***	Open Elective	3	0	0	40	60	100	3
4	Open Elective Courses	***	Open Elective	3	0	0	40	60	100	3
5	PROJECT	BEE800	Project-II	0	0	12	50	50	100	6
6			HONOR ELECTIVE 1/ MINOR ELECTIVE 1							
<b>Total</b>				<b>12</b>	<b>0</b>	<b>12</b>	<b>210</b>	<b>290</b>	<b>500</b>	<b>18</b>

Elective Courses Elective –VII & Elective –VIII	
BEE841	Introduction to MEMS
BEE842	Satellite Communication
BEE843	Biomedical Electronics
BEE844	Neural Networking and Fuzzy Logic
BEE845	Optical Fiber Communication
BEE846	Digital Image and Video Processing

## LIST OF COURSES FOR ADDITIONAL MINOR ENGINEERING (OFFERED BY ECE)

In order to have an additional Minor Engineering in Computer Science, a student has to earn additional minimum 20 credits either from the following courses or through MOOC/NPTEL courses subject to approval by the Dean/Head of the Faculty of Engineering, Design and Automation.

Course Code	Course Title	L	T	P	Cr
BME031	Electric and Hybrid Vehicle	3	0	0	3
BME032	Industrial Ergonomics	3	0	0	3
BME033	Introduction to Hydraulics and Pneumatics	3	0	0	3
BME034	Basic Thermodynamics and Heat Transfer	3	0	0	3
BME035	Energy Conservation	3	0	0	3
BME036	Solar Energy Utilisation	3	0	0	3
BME037	Material Handling System	3	0	0	3
BME038	Production and Operation management	3	0	0	3
BME039	Safety and Hazard Analysis	3	0	0	3
BMA031	Entrepreneurship	3	0	0	3
BMA032	Operations Management	3	0	0	3
BMA033	Management Information System	3	0	0	3
BMA034	Basics of CAD	2	0	2	3
BMA035	Basics of Additive Manufacturing	2	0	2	3
BEE031	Simulation and Modelling	1	0	4	3
BEE032	Industrial Robotics and control	3	0	0	3
BEE033	Network Securities	3	0	0	3
BEE034	Artificial Intelligence	3	0	0	3
BEE035	PLC and SCADA	3	0	0	3
BEE036	Internet of Things	3	0	0	3
BEE037	Biomedical Instrumentation	3	0	0	3
BEE038	Nano-Electronics	3	0	0	3
BAE031	Basics of Aerospace Engineering	3	0	0	3
BAE032	Basics of Aircraft Materials	3	0	0	3
QMD031	Quantitative methods for decision making	3	0	0	3
VAE031	Values and Ethics	3	0	0	3
EPI031	Economic Policies in India	3	0	0	3
FME031	Fundamentals of Management for Engineers	3	0	0	3
BCS041	Basics of Python Programming	2	0	2	3
BCS042	Introduction to Linux and Shell Programming	2	0	2	3
BCS043	Basics of Web Technologies	2	0	2	3
BCE031	Water pollution and its management	3	0	0	3
BCE032	Global warming and Climate Change	3	0	0	3
BCE033	Disaster Management and Mitigation	3	0	0	3
BCE034	Soil Chemistry and its impact	3	0	0	3
BCE035	Energy engineering technological and management	3	0	0	3
BCE036	Renewable energy technology	3	0	0	3
BCE037	Industrial pollution prevention and control	3	0	0	3
BCE038	Numerical method of Engineering	3	0	0	3

Sr. No.	Semester	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	3 <sup>rd</sup>	BEE302	Digital Electronics	3	0	0	40	60	100	3
2	3 <sup>rd</sup>	BEE322	Digital Electronics Laboratory	0	0	2	30	20	50	1
3	4 <sup>th</sup>	BEE403	Control System Engineering	3	0	0	40	60	100	3
4	4 <sup>th</sup>	BEE423	Control System Engineering Laboratory	0	0	2	30	20	50	1
5	5 <sup>th</sup>	BEE503	Digital Signal Processing	3	1	0	40	60	100	4
6	5 <sup>th</sup>	BEE523	Digital Signal Processing Laboratory	0	0	2	30	20	50	1
7	6 <sup>th</sup>	BEE601	Microprocessor and Microcontrollers	3	0	0	40	60	100	3
8	6 <sup>th</sup>	BEE621	Microprocessor and Microcontrollers Laboratory	0	0	2	30	20	50	1
9	7 <sup>th</sup>	BEE701	Robotics and Control	3	0	0	40	60	100	3
10	8 <sup>th</sup>	BEE844	Neural Networking and Fuzzy Logic	3	0	0	40	60	100	3
<b>Total:</b>				<b>18</b>	<b>1</b>	<b>8</b>	<b>360</b>	<b>440</b>	<b>800</b>	<b>23</b>

**B.TECH Minor** : Student has to select one technical course from list of MINOR ELECTIVES from 3<sup>rd</sup> Semester onwards.

**B.TECH HONOURS** : Student has to select technical course from MOOC's from 3<sup>rd</sup> Semester onwards. A student will be eligible to get B. Tech Electronics & Communication Engineering with Honours, if he/she completes an additional 20 credits. These could be acquired through MOOCs/NPTEL courses subject to approval by the Dean/Head of the Faculty of Engineering Design and Automation.

**D. In-House Summer Internship:**

- In house summer internship is a core course, to be done typically during the summer vacations. A student should undergo summer internship for 4 weeks, starting after year 1<sup>st</sup>, in the campus. Training of 2<sup>nd</sup> semester shall be graded and is essential part of the degree requirement in 3<sup>rd</sup> semester.
- Each Faculty shall nominate training coordinator from amongst the faculty members. The faculty will scrutinize the training report and will award marks, which must be sent to the controller of examination office. The summer training, submission of training report and obtaining pass grade is mandatory requirement for award of B.Tech Electronics & Communication Engineering degree.

**E. Industrial Training:**

A student should undergo industrial training for 6-8 weeks, starting after semester 4<sup>th</sup> and 6<sup>th</sup>, preferably in an industry, R & D institutions or in an academic institution of repute permitted. Training of 4<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 5<sup>th</sup> semester and training of 6<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 7<sup>th</sup> semester. This industrial training program is compulsory and an integral part of the Program. The Placement Officer will assist the students in finding suitable training assignments / projects.

The industrial training aims at achieving the following objectives:

- (a) Application of knowledge and techniques learnt in the first and second year to real life situation and make them better prepared to enrich their learning in the upcoming semesters.
- (b) Appreciating the inter-linkage among different functions and developing a realistic perspective about organizations in their totality. The students should take the industrial training seriously. They are expected to diligently in the job. A faculty member will work closely with the company to define the scope of the industrial training and ensure

proper understanding of the terms of engagement by all concerned. The student should be ready to not only learn from the followed practices in the Industry but also present a professional front i.e. being punctual at the workplace, well behaved and appropriately dressed. At the end of the training, the student should submit a brief report explaining briefly the key learning points and the insights gained. A 'certificate of completion' from the host organization is essential. The Industry training shall be credited as approved in the curricula. The industrial training, submission of training report and obtaining pass grade is mandatory requirement for award of B.Tech. Electronic and Communication Engineering degree.

- F. Major Project:** A major project shall be a multifaceted assignment that serves as a culminating academic and intellectual experience for students, typically during their final year at the University. Major projects may take a wide variety of forms, but they shall be Semester long investigative projects that culminate in a final product, presentation, or performance. In projects under the guidance of a faculty member, a final year student is required to do some innovative work with application of knowledge earned while undergoing various courses and labs in the earlier years. The student is expected to do literature survey and carry out development and/or experimentation. Through the project work the student must exhibit both the analytical and practical skills. The student will have to do his/her project under the guidance of the faculty member from the same department unless specifically permitted by the Head of the Department for alternate arrangements.

## B.TECH. MECHATRONICS ENGINEERING.

### A. Program Outcomes:

- PO1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 Design/development of solutions:** 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.
- PO4 Conduct investigations of complex problems:** 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.
- PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- PO6 The engineer and society:** 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.
- PO7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge, and need for sustainable development.
- PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 Communication:** 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.

- PO11 Project management and finance:** 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.
- PO12 Life-long learning:** 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.

### B. Program Specific Outcomes:

- PSO1** Analyze, design and develop mechatronics systems to solve complex engineering problems by integrating mechanical, electronic and control systems.
- PSO2** Plan, including methods design, process plan, process automation, and quality assurance systems to develop given mechatronics systems.
- PSO3** Adopt a multidisciplinary approach to solve real-world industrial problems.

### C. Program Structure: As per GNA University.

#### Details of Courses under B.Tech. Mechatronics Engineering.

S. No	Course Category	Theory	Theory & Tutorial	Practical	Theory & Practical	Total Credits
1	BSC	NIL	5*4=20	2*2=2	NIL	22
2	ESC	2*3=6	1*4=4	3*2=3 2*4=4	2*4=6	23
3	HSMC	2*3=6 2*2=4	NIL	2*2=2	NIL	12
4	PCC	9*3=27	4*4=16 1*5=5	12*2=12	NIL	60
5	PEC	6*3=18	NIL	NIL	NIL	18
6	OEC	6*3=18	NIL	NIL	NIL	18
7	MC	2*2=0	NIL	NIL	NIL	0
8	PROJ	NIL	NIL	1*0 = 2 1*2 = 1 1*8 = 4 1*16 = 8	NIL	15
9	LC	<b>26 courses of 38 credit</b>				----
<b>Total Credits</b>		<b>79</b>	<b>45</b>	<b>38</b>	<b>6</b>	<b>168</b>

Note: Subject X Hours = Credits



## Program Structure B.Tech. Mechatronics Engineering

## Semester I (First year) - GROUP-A

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
		*BTM102	Mathematics – I							
3	Engineering Science course	BCS 101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME101	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS 121	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	English Communication Lab	0	0	2	30	20	50	1
10	Mandatory courses	BMC001	Environmental Science	2	0	0	40	0	40	0
<b>Total</b>				<b>14</b>	<b>2</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>21</b>

\*The course Mathematics - I (BTM102) is offered in B. Tech. Computer Science and Engineering only.

## Semester I (First year) -GROUP-B

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM201	Calculus and Linear Algebra	3	1	0	40	60	100	4
		*BTM102	Mathematics – I							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME201	Engineering Drawing and Graphics-2D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM101	English Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM121	English Communication Lab	0	0	2	30	20	50	1
10	Mandatory courses	BMC001	Environmental Science	2	0	0	40	0	40	0
<b>Total</b>				<b>14</b>	<b>3</b>	<b>13</b>	<b>390</b>	<b>400</b>	<b>790</b>	<b>22</b>

\* The Course Engineering Physics (BTP101) and Engineering Physics Laboratory (BTP121) are offered to B. Tech Mechanical, Civil, Aerospace, Electronics and Communication & Mechatronics Engineering

\*The course Mathematics – I (BTM102) is offered in B. Tech. Computer Science and Engineering only.

## Semester II (First year) -GROUP-A

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	*BTP101	Engineering Physics	3	1	0	40	60	100	4
		**BTP102	Semiconductor Physics							
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics-II							
3	Engineering Science course	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	Engineering Science course	BME201	Engineering Drawing and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM201	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	*BTP121	Engineering Physics Laboratory	0	0	2	30	20	50	1
		**BTP122	Semiconductor Physics Laboratory							
7	Engineering Science course	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
8	Engineering Science course	BME122	Manufacturing Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>3</b>	<b>13</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>22</b>

\*\*The Course Semiconductor Physics (BTP102) and Semiconductor Physics Laboratory (BTP122) are offered to B. Tech Computer Science Engineering, B.Tech. Mechanical and Automation Engineering and B.Tech. Robotics and Automation Engineering)

\*The course Mathematics - II (BTM202) is offered in B. Tech. Computer Science and Engineering only.

**Note: There shall be a summer internship of 4 weeks duration at the end of 2<sup>nd</sup> semester. The assessment for this will be included in the 3<sup>rd</sup> semester.**

## Semester II (First year) -GROUP-B

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science course	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	Basic Science course	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
		*BTM202	Mathematics-II							
3	Engineering Science course	BCS101	Programming for Problem Solving	3	0	0	40	60	100	3
4	Engineering Science course	BME201	Engineering Drawing and Graphics-3D	1	0	3	40	60	100	3
5	Humanities & Social Sciences including Management courses	COM201	Business Communication	2	0	0	40	60	100	2
6	Basic Science course	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
7	Engineering Science course	BCS122	Programming for Problem Solving Lab	0	0	2	30	20	50	1
8	Engineering Science course	BME121	Workshop Practices	0	0	4	60	40	100	2
9	Humanities & Social Sciences including Management courses	COM221	Business Communication Lab	0	0	2	30	20	50	1
<b>Total</b>				<b>12</b>	<b>2</b>	<b>13</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>21</b>

\*The course Mathematics - II (BTM202) is offered in B. Tech. Computer Science and Engineering only.

**Note: There shall be a summer training of 4 weeks duration at the end of 2<sup>nd</sup> semester. The assessment for this will be included in the 3<sup>rd</sup> semester.**

## Semester III (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits	
				L	T	P	Internal	External			
1	Professional Core Courses	BMT301	Applied Mechanics	3	0	0	40	60	100	3	
2	Professional Core Courses	BME402	Fluid Mechanics	3	1	0	40	60	100	4	
3	Professional Core Courses	BEE302	Digital Electronics	3	0	0	40	60	100	3	
4	Engineering Science Courses	BME303	Materials Engineering	3	0	0	40	60	100	3	
5	Humanities & Social Sciences including Management courses	HVE001	Human Values and Professional Ethics	3	0	0	40	60	100	3	
6	Professional Core Courses	BME422	Fluid Mechanics Laboratory	0	0	2	30	20	50	1	
7	Professional Core Courses	BEE322	Digital Electronics Laboratory	0	0	2	30	20	50	1	
8	Engineering Science Courses	BME323	Materials Engineering Laboratory	0	0	2	30	20	50	1	
9	Open Elective Courses		Open Elective-I	3	0	0	40	60	100	3	
10	Summer Training	BMT300	Summer Internship*	-	-	-	40	-	40	S/US (Non-Credit)	
<b>Total</b>				<b>18</b>	<b>1</b>	<b>6</b>	<b>370</b>	<b>420</b>	<b>790</b>	<b>22</b>	

\*Summer Internship will be imparted internally at the end of 2<sup>nd</sup> semester for four (04) weeks duration

## Semester IV (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits	
				L	T	P	Internal	External			
1	Professional Core Courses	BEE402	Analog Circuits	3	0	0	40	60	100	3	
2	Professional Core Courses	BME301	Strength of Materials	3	1	0	40	60	100	4	
3	Professional Core Courses	BME302	Theory of Machines	3	1	0	40	60	100	4	
4	Professional Core Courses	BEE403	Control System Engineering	3	0	0	40	60	100	3	
5	Basic Science course	BTM301	Transform & Discrete Mathematics	3	1	0	40	60	100	4	
6	Professional Core Courses	BEE422	Analog Circuits Laboratory	0	0	2	30	20	50	1	
7	Professional Core Courses	BME321	Strength of Materials Laboratory	0	0	2	30	20	50	1	
8	Professional Core Courses	BME322	Theory of Machines Laboratory	0	0	2	30	20	50	1	
9	Professional Core Courses	BEE 423	Control System Engineering Laboratory	0	0	2	30	20	50	1	
10	Open Elective Courses		Open Elective-II	3	0	0	40	60	100	3	
<b>Total</b>				<b>18</b>	<b>3</b>	<b>8</b>	<b>360</b>	<b>440</b>	<b>770</b>	<b>25</b>	

\*Note: There shall be an industrial training of six (06) weeks duration at the end of 4<sup>th</sup> semester.

The credits earned for this will be included in the 5<sup>th</sup> semester.

## Semester V (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BEE501	Digital Communication System	3	0	0	40	60	100	3
2	Professional Core Courses	BME502	Fluid Machinery	3	1	0	40	60	100	4
3	Professional Core Courses	BME503	Manufacturing Processes	3	0	0	40	60	100	3
4	Humanities & Social Sciences including Management courses	OPR001	Operations Research	3	0	0	40	60	100	3
5	PROJ	BMT500	Industrial Training	0	0	0	50	50	100	2
6	Professional Core Courses	BEE521	Digital Communication System Laboratory	0	0	2	30	20	50	1
7	Professional Core Courses	BME522	Fluid Machinery Laboratory	0	0	2	30	20	50	1
8	Professional Core Courses	BME523	Manufacturing Processes Laboratory	0	0	2	30	20	50	1
9	Mandatory Courses	BMC002	Constitution of India	2	0	0	40	0	40	S/US (Non-Credit)
10	Open Elective Courses		Open Elective-III	3	0	0	40	60	100	3
<b>Total</b>				<b>17</b>	<b>1</b>	<b>6</b>	<b>380</b>	<b>410</b>	<b>790</b>	<b>21</b>

## Semester VI (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BMT601	Hydraulic and Pneumatics	3	0	0	40	60	100	3
2	Professional Core Courses	BEE601	Microprocessors and Microcontrollers	3	0	0	40	60	100	3
3	Professional Core Courses	BME603	Machine Design	3	2	0	40	60	100	5
4	Professional Elective Courses	BME*	Elective – I	3	0	0	40	60	100	3
5	Professional Elective Courses	BEE*	Elective – II	3	0	0	40	60	100	3
6	PROJECT	#BMT600	Minor Project	0	0	2	50	50	100	1
7	Professional Core Courses	BMT621	Hydraulics and Pneumatics Laboratory	0	0	2	30	20	50	1
8	Professional Core Courses	BEE621	Microprocessors and Microcontrollers Laboratory	0	0	2	30	20	50	1
<b>Total</b>				<b>15</b>	<b>2</b>	<b>6</b>	<b>310</b>	<b>390</b>	<b>700</b>	<b>20</b>

# Minor project includes selection of major Project topic, Introduction/ principles/ theory/ concepts of the project, detail literature study on the topic and requirements & methodology for the completion of the project.

Note: The students are required to undergo industrial / software training for minimum of four (04) weeks duration at the end of 6<sup>th</sup> semester. The assessment for the same will be done in the 7<sup>th</sup> semester.

## Semester VII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Elective Courses	BMT701	Programmable Logic Controller and SCADA	3	0	0	40	60	100	3
2	Professional Elective Courses	BME**	Elective – III	3	0	0	40	60	100	3
3	Professional Elective Courses	BEE**	Elective – IV	3	0	0	40	60	100	3
4	Professional Core Courses	BMT721	Programmable Logic Controller and SCADA Laboratory	0	0	2	30	20	50	1
5	PROJECT	BMT700	Major Project	0	0	8	50	50	100	4
6	Open Elective Courses		Open Elective – IV	3	0	0	40	60	100	3
7	PROJECT	BMTI700	Industrial/Software Training	-	-	-	50	50	100	S/US (Non-Credit)
<b>Total</b>				<b>12</b>	<b>0</b>	<b>10</b>	<b>290</b>	<b>360</b>	<b>650</b>	<b>17</b>

## Semester VIII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Elective Courses	BME***	Elective – V	3	0	0	40	60	100	3
2	Professional Elective Courses	BEE***	Elective -VI	3	0	0	40	60	100	3
3	Open Elective Courses	***	Open Elective-V	3	0	0	40	60	100	3
4	Open Elective Courses	***	Open Elective-VI	3	0	0	40	60	100	3
5	PROJECT	BMT800	Industrial Defined Project	0	0	16	50	50	100	8
<b>Total</b>				<b>12</b>	<b>0</b>	<b>16</b>	<b>210</b>	<b>290</b>	<b>500</b>	<b>20</b>

A student will be eligible to get B. Tech. Mechatronics Engineering with Honours or minor engineering, if he/she completes an additional 18- 20 credits. These could be acquired through MOOCs/NPTEL courses subject to approval by the Dean/Head of the Faculty of Engineering Design and Automation.

## LIST OF PROFESSIONAL ELECTIVES COURSES

## \*Elective –I and II

Course Code	Course Title
BME641	Internal Combustion Engines
BME602	Industrial Instrumentation & Metrology
BME645	Advanced Machining Processes
BEE641	Information Theory and Coding
BEE642	Power Electronics
BEE643	Electronic Measurements & Instrumentation
BME648	Industrial Automation and Robotics

## \*\*Elective –III &amp; IV

Course Code	Course Title
BME701	Mechanical Vibrations
BME742	Advanced Metal Cutting
BME747	Fluid Power Systems
BEE743	Embedded Systems
BEE744	Microwave and Radar Engineering
BEE746	Wireless Sensor Networks

## \*\*\*Elective –V &amp; VI

Course Code	Course Title
BME841	Automobile Technology
BME842	Additive Manufacturing
BME642	Non- Conventional Energy Sources
BME844	Non-Destructive Testing
BEE841	Introduction to MEMS
BEE843	Biomedical Electronics

## LIST OF OPEN ELECTIVE COURSES

Course Code	Course Title	L	T	P	Cr
BME031	Electric and Hybrid Vehicle	3	0	0	3
BME032	Industrial Ergonomics	3	0	0	3
BME033	Introduction to Hydraulics and Pneumatics	3	0	0	3
BME034	Basic Thermodynamics and Heat Transfer	3	0	0	3
BME035	Energy Conservation	3	0	0	3
BME036	Solar Energy Utilization	3	0	0	3
BME037	Material Handling System	3	0	0	3
BME038	Production and Operation management	3	0	0	3
BME039	Safety and Hazard Analysis	3	0	0	3
BMA031	Entrepreneurship	3	0	0	3
BMA032	Operations Management	3	0	0	3
BMA033	Management Information System	3	0	0	3
BMA034	Basics of CAD	2	0	2	3
BMA035	Basics of Additive Manufacturing	2	0	2	3
BEE031	Simulation and Modelling	1	0	4	3
BEE032	Industrial Robotics and control	3	0	0	3
BEE033	Network Securities	3	0	0	3
BEE034	Artificial Intelligence	3	0	0	3
BEE035	PLC and SCADA	3	0	0	3
BEE036	Internet of Things	3	0	0	3
BEE037	Biomedical Instrumentation	3	0	0	3
BEE038	Nanoelectronics	3	0	0	3
BEE039	Composite Materials	3	0	0	3
BAE031	Introduction to Aerospace Engineering	3	0	0	3
BAE032	Aircraft Materials	3	0	0	3
QMD031	Quantitative methods for decision making	3	0	0	3
VAE 031	Values and Ethics	3	0	0	3
EPI 031	Economic Policies in India	3	0	0	3
FME 031	Fundamentals of Management for Engineers	3	0	0	3
BCS041	Basics of Python Programming	2	0	2	3
BCS042	Introduction to Linux and Shell Programming	2	0	2	3
BCS 043	Basics of Web Technologies	2	0	2	3
BCE031	Water pollution and its management	3	0	0	3
BCE032	Global warming and Climate Change	3	0	0	3
BCE033	Disaster Management and Mitigation	3	0	0	3
BCE034	Soil Chemistry and its impact	3	0	0	3
BCE035	Energy engineering technological and management	3	0	0	3
BCE036	Renewable energy technology	3	0	0	3
BCE037	Industrial pollution prevention and control	3	0	0	3
BCE038	Numerical methods of Engineering	3	0	0	3

**D. Summer Internship:**

- Summer internship is a core course, to be done typically during the summer vacations. A student should undergo summer internship for 4 weeks, starting after year 1<sup>st</sup>, in the campus. Internship of 2<sup>nd</sup> semester shall be graded and is essential part of the degree requirement in 3<sup>rd</sup> semester.
- Each Faculty shall nominate training coordinator from amongst the faculty members. The faculty will scrutinize the internship training report and will award marks, which must be sent to the controller of examination office. The summer internship, submission of training report and obtaining pass grade is mandatory requirement for award of B.Tech Mechatronics Engineering degree.

**E. Industrial Training:**

A student should undergo industrial training for 6-8 weeks, starting after semester 4<sup>th</sup> and 6<sup>th</sup>, preferably in an industry, R & D institutions or in an academic institution of repute permitted. Training of 4<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 5<sup>th</sup> semester and training of 6<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 7<sup>th</sup> semester. This industrial training program is compulsory and an integral part of the Program. The Placement Officer will assist the students in finding suitable training assignments / projects.

The industrial training aims at achieving the following objectives:

- (a) Application of knowledge and techniques learnt in the first and second year to real life situation and make them better prepared to enrich their learning in the upcoming semesters.
- (b) Appreciating the inter-linkage among different functions and developing a realistic perspective about organizations in their totality. The students should take the industrial training seriously. They are expected to diligently in the job. A faculty member will work closely with the company to define the scope of the industrial training and ensure

proper understanding of the terms of engagement by all concerned. The student should be ready to not only learn from the followed practices in the Industry but also present a professional front i.e. being punctual at the workplace, well behaved and appropriately dressed. At the end of the training, the student should submit a brief report explaining briefly the key learning points and the insights gained. A 'certificate of completion' from the host organization is essential. The Industry training shall be credited as approved in the curricula. The industrial training, submission of training report and obtaining pass grade is mandatory requirement for award of B.Tech. Mechatronics Engineering degree.

- F. Major Project:** A major project shall be a multifaceted assignment that serves as a culminating academic and intellectual experience for students, typically during their final year at the University. Major projects may take a wide variety of forms, but they shall be Semester long investigative projects that culminate in a final product, presentation, or performance. In projects under the guidance of a faculty member, a final year student is required to do some innovative work with application of knowledge earned while undergoing various courses and labs in the earlier years. The student is expected to do literature survey and carry out development and/or experimentation. Through the project work the student must exhibit both the analytical and practical skills. The student will have to do his/her project under the guidance of the faculty member from the same department unless specifically permitted by the Head of the Department for alternate arrangements.

## B.TECH. MECHANICAL AND AUTOMATION ENGINEERING

### A. Program Outcomes:

- PO1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 Design/development of solutions:** 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.
- PO4 Conduct investigations of complex problems:** 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.
- PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- PO6 The engineer and society:** 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.
- Po7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge, and need for sustainable development.
- PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 Communication:** 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.

- PO11 Project management and finance:** 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.
- PO12 Life-long learning:** 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.

### B. Program Specific Outcomes:

- PSO1** Apply their knowledge to the domain of thermal, solid mechanics, mechanics of machines and fluid mechanics and to solve the engineering problems arising out of these areas.
- PSO2** Analyze and provide a solution to real life problems related to mechanical engineering fields together with the allied engineering branches.
- PSO3** Practice and implement new ideas for the product design and development and to provide the adequate design and manufacturing solution through the updated CAD/CAM technologies.
- PSO4** Provide the solution to automate the various manual processes for the industry and identify the various components required for it.



Semester I (First Year) (Group A)										
S.No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution			Credits
				L	T	P	Internal	External	Total	
1	BSC	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	BSC	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
3	ESC	BCS101	Programming for Problem Solving	3	0	0	40	60	100	3
4	ESC	BME101	Engineering Drawing & Graphics – 2D	1	0	3	40	60	100	3
5	HSMC	COM101	English Communication	2	0	0	40	60	100	2
6	LC	BME121	Workshop Practices	0	0	4	60	40	100	2
7	LC	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
8	LC	BCS121	Programming for Problem Solving Laboratory	0	0	2	30	20	50	1
9	LC	COM121	English Communication Lab	0	0	2	30	20	50	1
10.	HSMC	ENV001	Environmental Science	2	0	0	40	0	40	S/US (Non-Credit)
<b>Total</b>							<b>390</b>	<b>400</b>	<b>790</b>	<b>21</b>

Semester II (First Year) (Group A)										
S.No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution			Credits
				L	T	P	Internal	External	Total	
1	BSC	BTP102	Semiconductor Physics	3	1	0	40	60	100	4
2	BSC	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4
3	ESC	BEE101	Basic Electrical and Electronics Engineering	3	1	0	40	60	100	4
4	ESC	BME201	Engineering Drawing & Graphics – 3D	1	0	3	40	60	100	3
5	HSMC	COM201	Business Communication	2	0	0	40	60	100	2
6	LC	BME122	Manufacturing Practices	0	0	4	60	40	100	2
7	LC	BTP122	Semiconductor Physics Laboratory	0	0	2	30	20	50	1
8	LC	BEE121	Basic Electrical and Electronics Engineering Laboratory	0	0	2	30	20	50	1
9	LC	COM221	Business Communication Lab	0	0	2	30	20	50	1
10.	MC	BMC001	Constitution of India	2	0	0	40	0	40	S/US (Non-Credit)
<b>Total</b>							<b>390</b>	<b>400</b>	<b>790</b>	<b>22</b>

**Note:** The course structure for semester first and second is given for group A.

In case of group B, courses in semesters first and second will be flipped with courses in semester second and first respectively.

## Semester III (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Basic Science Course	BTM301	Transform & Discrete Mathematics	3	1	0	40	60	100	4
2	Engineering Science course	BEE301	Electronic Devices	3	0	0	40	60	100	3
3	Professional Core Courses	BMA301	Thermodynamics	3	1	0	40	60	100	4
4	Professional Core Courses	BMA302	Computer Aided Design-I	2	0	0	40	60	100	2
5	Engineering Science course	BEE321	Electronic Devices Laboratory	0	0	2	30	20	50	1
6	Laboratory Course	BMA321	Thermodynamics Laboratory	0	0	2	30	20	50	1
7	Laboratory Course	BMA322	Computer Aided Design-I Laboratory	0	0	4	60	40	100	2
8	PROJ	BMA300	Summer Training*	0	0	20	60	40	100	S/US
<b>Total</b>							<b>340</b>	<b>360</b>	<b>700</b>	<b>17</b>

\*NOTE: The students will take 6weeks (120 hours) summer training after 2<sup>nd</sup> semester. The evaluation of this summer training will be done in the 3<sup>rd</sup> semester.

## Semester IV (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Engineering Science course	BME401	Material Engineering	3	0	0	40	60	100	3
2	Professional Core Courses	BMA401	Fluid Mechanics and Fluid Machinery	3	1	0	40	60	100	4
3	Professional Core Courses	BMA402	Strength of Material	3	1	0	40	60	100	4
4	Professional Core Courses	BMA403	Computer Aided Design-II	2	0	0	40	60	100	2
5	Professional Elective Courses		Elective-I	3	0	0	40	60	100	3
6	Laboratory Course	BME421	Material Engineering Laboratory	0	0	2	30	20	50	1
7	Laboratory Course	BMA421	Fluid Mechanics and Fluid Machinery Laboratory	0	0	2	30	20	50	1
8	Laboratory Course	BMA422	Strength of Material Laboratory	0	0	2	30	20	50	1
9	Laboratory Course	BMA423	Computer Aided Design-II Laboratory	0	0	4	60	40	100	2
10	Laboratory Course		Elective-I Laboratory	0	0	2	30	20	50	1
<b>Total</b>							<b>380</b>	<b>420</b>	<b>800</b>	<b>22</b>

## Semester V (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BMA501	Manufacturing Processes	3	0	0	40	60	100	3
2	Professional Core Courses	BMA502	Kinematics and Theory of Machines	3	1	0	40	60	100	4
3	Professional Core Courses	BMA503	IC Engines	3	0	0	40	60	100	3
4	Professional Core Courses	BMA504	Computer Aided Design-III	2	0	0	40	60	100	2
5	Professional Elective Courses		Elective-II	3	0	0	40	60	100	3
6	Professional Elective Courses		Elective-III	3	0	0	40	60	100	3
7	Laboratory Course	BMA521	Manufacturing Processes Laboratory	0	0	2	30	20	50	1
8	Laboratory Course	BMA522	Kinematics and Theory of Machines Laboratory	0	0	2	30	20	50	1
9	Laboratory Course	BMA523	IC Engines Laboratory	0	0	2	30	20	50	1
10	Laboratory Course	BMA524	Computer Aided Design-III Laboratory	0	0	4	60	40	100	2
11	Laboratory Course		Elective-II Laboratory	0	0	2	30	20	50	1
12	PROJ	BMA500	Software/Industrial Training	0	0	20	60	40	100	2
13	Mandatory Course	BMC003	Essence of Indian Traditional Knowledge	2	0	0	40	0	40	S/US
<b>Total</b>							<b>520</b>	<b>520</b>	<b>1040</b>	<b>26</b>

\*NOTE: The students will take 6 weeks (120 hours) Software/Industrial training after semester 4th. The evaluation of this Software/Industrial training will be done in the 5<sup>th</sup> semester.

## Semester VI (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BMA601	Additive Manufacturing	3	0	0	40	60	100	3
2	Professional Core Courses	BMA602	Jigs and Fixtures	3	0	0	40	60	100	3
3	Professional Elective Courses		Elective-IV	3	0	0	40	60	100	3
4	Open Elective Courses		Open Elective-I	3	0	0	40	60	100	3
5	Open Elective Courses		Open Elective-II	3	0	0	40	60	100	3
6	Humanities & Social Sciences including Management courses		Humanities	3	0	0	40	60	100	3
7	Laboratory Course	BMA621	Additive Manufacturing Laboratory	0	0	2	30	20	50	1
8	Laboratory Course	BMA622	Jigs and Fixtures Laboratory	0	0	2	30	20	50	1
<b>Total</b>							<b>300</b>	<b>400</b>	<b>700</b>	<b>20</b>

## Semester VII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BMA701	Computer Aided Engineering	3	1	0	40	60	100	4
2	Professional Core Courses	BMA702	Tool Design	3	0	0	40	60	100	3
3	Professional Elective Courses		Elective - V	3	0	0	40	60	100	3
4	Professional Elective Courses		Elective-VI	3	0	0	40	60	100	3
5	Open Elective Courses		Open Elective-III	3	0	0	40	60	100	3
6	Humanities & Social Sciences including Management courses		Humanities	3	0	0	40	60	100	3
7	Laboratory Course	BMA721	Computer Aided Engineering Laboratory	0	0	4	60	40	100	2
8	Laboratory Course	BMA722	Tool Design Laboratory	0	0	4	60	40	100	2
<b>Total</b>							<b>360</b>	<b>440</b>	<b>800</b>	<b>23</b>

## Semester VIII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Elective Courses		Elective - VII	3	0	0	40	60	100	3
2	Open Elective Courses		Open Elective - IV	3	0	0	40	60	100	3
			Elective – VII Laboratory	0	0	2	30	20	50	1
3	PROJ	BMA800	Industry Defined Project	0	0	0	100	100	200	8
<b>Total</b>							<b>210</b>	<b>240</b>	<b>450</b>	<b>15</b>

## List of Professional Core Elective Courses

## Elective-I (Semester-4)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BMA441	Micro-controller and Micro-processor	3	0	0	3	3
2	PEC	BMA442	Automobile Engineering	3	0	0	3	3
3	PEC	BMA443	Industrial Engineering	3	0	0	3	3
4	PEC	BMA444	Robotics	3	0	0	3	3
5	PEC	BMA424	Micro-controller and Micro-processor Laboratory	0	0	2	2	1
6	PEC	BMA425	Automobile Engineering Laboratory	0	0	2	2	1
7	PEC	BMA426	Industrial Engineering Laboratory	0	0	2	2	1
8	PEC	BMA427	Robotics Laboratory	0	0	2	2	1

## Elective-II (Semester-5)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BMA541	Fluid Systems	3	0	0	0	3
2	PEC	BMA542	Heat Transfer	3	0	0	0	3
3	PEC	BMA543	Numerical Methods	3	0	0	0	3
4	PEC	BMA544	Data Communication and Networks	3	0	0	0	3
5	PEC	BMA525	Fluid Systems Laboratory	0	0	2	2	1
6	PEC	BMA526	Heat Transfer Laboratory	0	0	2	2	1
7	PEC	BMA527	Numerical Methods Laboratory	0	0	2	2	1
8	PEC	BMA528	Data Communication and Networks Laboratory	0	0	2	2	1

## Elective-III (Semester-5)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BMA545	Mechatronics	3	0	0	3	3
2	PEC	BMA546	Renewable Energy	3	0	0	3	3
3	PEC	BMA547	Composite Materials	3	0	0	3	3
4	PEC	BMA548	Power Plant Engineering	3	0	0	3	3

## Elective-IV (Semester-6)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BMA641	Non – Traditional Machining	3	0	0	3	3
2	PEC	BMA642	Metrology and Quality Assurance	3	0	0	3	3
3	PEC	BMA643	Mechanical Vibration	3	0	0	3	3
4	PEC	BMA644	Nanotechnology	3	0	0	3	3

## Elective-V (Semester-7)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BMA741	Non Destructive Testing	3	0	0	3	3
2	PEC	BMA742	Industrial Safety	3	0	0	3	3
3	PEC	BMA743	Operations Research	3	0	0	3	3
4	PEC	BMA744	Reliability and Quality Control	3	0	0	3	3

## Elective-VI (Semester-7)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BMA745	Maintenance Engineering	3	0	0	3	3
2	PEC	BMA746	Disaster Management	3	0	0	3	3
3	PEC	BMA747	Process Planning and Cost Estimation	3	0	0	3	3
4	PEC	BMA748	Tribology	3	0	0	3	3

## Elective-VII (Semester-8)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BMA841	Computer Aided Manufacturing	3	0	0	0	3
2	PEC	BMA842	Virtual Reality	3	0	0	0	3
3	PEC	BMA843	PLC Programming	3	0	0	0	3
4	PEC	BMA844	Refrigeration and Air Conditioning	3	0	0	0	3
5	PEC	BMA821	Computer Aided Manufacturing Lab	0	0	2	2	2
6	PEC	BMA822	Virtual Reality Laboratory	0	0	2	2	2
7	PEC	BMA823	PLC Programming Laboratory	0	0	2	2	2
8	PEC	BMA824	Refrigeration and Air Conditioning Lab	0	0	2	2	2

## List of Humanities &amp; Social Sciences including Management Courses:

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	HSMC	COM101	English Communication	2	0	0	2	2
2	HSMC	COM121	English Communication Lab	0	0	2	2	1
3	HSMC	COM201	Business Communication	2	0	0	2	2
4	HSMC	COM221	Business Communication Lab	0	0	2	2	1
5	HSMC	HRM001	Human Resource Management	3	0	0	3	3
6	HSMC	TQM001	Total Quality Management	3	0	0	3	3
7	HSMC	HBW001	Human Behavior at Work	3	0	0	3	3
8	HSMC	INP001	Industrial Psychology	3	0	0	3	3
9	HSMC	ENV001	Environmental Science	2	-	-	2	S/US (Non Credit)

## LIST OF OPEN ELECTIVE COURSES

Course Code	Course Title	L	T	P	Cr
BME031	Electric and Hybrid Vehicle	3	0	0	3
BME032	Industrial Ergonomics	3	0	0	3
BME033	Introduction to Hydraulics and Pneumatics	3	0	0	3
BME034	Basic Thermodynamics and Heat Transfer	3	0	0	3
BME035	Energy Conservation	3	0	0	3
BME036	Solar Energy Utilization	3	0	0	3
BME037	Material Handling System	3	0	0	3
BME038	Production and Operation management	3	0	0	3
BME039	Safety and Hazard Analysis	3	0	0	3
BMA031	Entrepreneurship	3	0	0	3
BMA032	Operations Management	3	0	0	3
BMA033	Management Information System	3	0	0	3
BMA034	Basics of CAD	2	0	2	3
BMA035	Basics of Additive Manufacturing	2	0	2	3
BEE031	Simulation and Modelling	1	0	4	3
BEE032	Industrial Robotics and control	3	0	0	3
BEE033	Network Securities	3	0	0	3
BEE034	Artificial Intelligence	3	0	0	3
BEE035	PLC and SCADA	3	0	0	3
BEE036	Internet of Things	3	0	0	3
BEE037	Biomedical Instrumentation	3	0	0	3
BEE038	Nanoelectronics	3	0	0	3
BEE039	Composite Materials	3	0	0	3
BAE031	Introduction to Aerospace Engineering	3	0	0	3
BAE032	Aircraft Materials	3	0	0	3
QMD031	Quantitative methods for decision making	3	0	0	3
VAE 031	Values and Ethics	3	0	0	3
EPI 031	Economic Policies in India	3	0	0	3
FME 031	Fundamentals of Management for Engineers	3	0	0	3
BCS041	Basics of Python Programming	2	0	2	3
BCS042	Introduction to Linux and Shell Programming	2	0	2	3
BCS 043	Basics of Web Technologies	2	0	2	3
BCE031	Water pollution and its management	3	0	0	3
BCE032	Global warming and Climate Change	3	0	0	3
BCE033	Disaster Management and Mitigation	3	0	0	3
BCE034	Soil Chemistry and its impact	3	0	0	3
BCE035	Energy engineering technological and management	3	0	0	3
BCE036	Renewable energy technology	3	0	0	3
BCE037	Industrial pollution prevention and control	3	0	0	3
BCE038	Numerical methods of Engineering	3	0	0	3

## List of Courses for B. Tech Mechanical and Automation Engineering (Honors)

Sr. No.	Course Code	Course Title	Semester	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	BMA303	Ergonomics	III	4	0	0	4	4
2	BMA404	Internet of Things	IV	4	0	0	4	4
3	BMA505	Product Design and Development	V	4	0	0	4	4
4	BMA603	Product Lifecycle Management	VI	4	0	0	4	4
5	BMA703	PLC and HMI Programming	VII	4	0	0	4	4

## SUMMARY OF CREDIT DISTRIBUTION

Sr. No.	Category	Credits Per Semester								Credits
		I	II	III	IV	V	VI	VII	VIII	
1	BSC	9	9	4	0	0	0	0	0	22
2	ESC	10	9	4	4	0	0	0	0	27
3	PCC	0	0	9	14	17	8	10	0	58
4	PEC	0	0	0	4	7	3	7	4	25
5	HSMC	3	3	0	0	0	3	3	0	12
6	OE	0	0	0	0	0	6	3	3	12
7	PROJECT	0	0	0	0	2	0	0	8	10
	<b>TOTAL</b>	<b>22</b>	<b>21</b>	<b>17</b>	<b>22</b>	<b>26</b>	<b>20</b>	<b>23</b>	<b>15</b>	<b>166</b>

## D. Summer Training:

- Summer training is a core course, to be done typically during the summer vacations. A student should undergo summer training for 4-6 weeks, starting after year 3<sup>rd</sup>, preferably in an industry, R & D institutions or in an academic institution is of repute permitted. Training of 4<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 5<sup>th</sup> semester.
- It is the responsibility of the Corporate Relations Department (CRD) to arrange training for all the students. In the beginning of each academic session, Corporate Relations Department will prepare a program wise list of potential training organizations. These organizations will be approached by the Corporate Relations Department with a request to provide training seats. Consolidated lists of training offers will be made available to the eligible students in the beginning of even semester of the session. If a student is interested in making his/her own arrangement for the training seat, he/she will need to have the training organization approved by routing the application to the Dean of B.Tech. Mechanical and Automation Engineering for approval.
- The students will be required to get their training activity and results reviewed by organization in which they have attended the training. Each Faculty shall nominate training coordinator from amongst the faculty members. The faculty will scrutinize the training report and the certificate issued by the corporate and will award a satisfactory/unsatisfactory grade, which must be sent to the controller of examination office within one month of commencement of next semester. In case the training is considered to be unsatisfactory, an 'Unsatisfactory' grade will be awarded and the student shall have to undergo fresh summer training in part or full duration as decided by the Dean of B.Tech. Mechanical and Automation Engineering. The summer training, submission of training report and obtaining satisfactory grade is mandatory requirement for award of B.Tech MAE degree.

### E. Industry Exposure Program:

A student should undergo industrial training for 4-6 weeks, starting after year 3<sup>rd</sup>, preferably in an industry, R & D institutions or in an academic institution is of repute permitted. Training of 4<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 5<sup>th</sup> semester. This industry exposure program is compulsory and an integral part of the Program. The Placement Office will assist the students in finding suitable summer assignments/projects.

The industrial training aims at achieving the following objectives:

- (a) Application of knowledge and techniques learnt in the first and second year to real life situation and make them better prepared to enrich their learning in the upcoming semesters.
- (b) Appreciating the inter-linkage among different functions and developing a realistic perspective about organizations in their totality. The students should take the industrial training seriously. They are expected to diligently in the job. A faculty member will work closely with the company to define the scope of the industrial training and ensure proper understanding of the terms of engagement by all concerned. The student should be ready to not only learn from the followed practices in the Industry but also present a professional front i.e. being punctual at the workplace, well behaved and appropriately dressed. At the end of the training, the student should submit a brief report explaining briefly the key learning points and the insights gained. A 'certificate of completion' from the host organization is essential. The Industry training shall be credited as approved in the curricula. The industrial training, submission of training report and obtaining satisfactory grade is mandatory requirement for award of B.Tech MAE degree.

## B.TECH. ROBOTICS AND AUTOMATION ENGINEERING

### A. Program Outcomes:

- PO1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 Design/development of solutions:** 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.
- PO4 Conduct investigations of complex problems:** 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.
- PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- PO6 The engineer and society:** 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.
- PO7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge, and need for sustainable development.
- PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 Communication:** 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.



- PO11 Project management and finance:** 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.
- PO12 Life-long learning:** 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.

#### B. Program Specific Outcomes:

- PSO1** Apply the knowledge to plan the trajectory for various robotic manipulators by using different techniques.
- PSO2** Understand and adapt to the different robotic control environments, robotic vision and various sensing techniques.
- PSO3** Apply the skills to solve complex multi-disciplinary problems, identify the type of robotic manipulator required and to provide a Robotic solution to serve the purpose.
- PSO4** Practice and implement new ideas for the product design and development and to provide the adequate design and manufacturing solution through the updated CAD/CAM technologies.

#### Semester I (First year) Branch/Course: B.Tech. Robotics and Automation Engineering Semester I (First Year)

Semester I (First Year) (Group A)										
S.No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution			Credits
				L	T	P	Internal	External	Total	
1	BSC	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	BSC	BTM101	Calculus and Linear Algebra	3	1	0	40	60	100	4
3	ESC	BCS101	Programming for Problem Solving	3	0	0	40	60	100	3
4	ESC	BME101	Engineering Drawing & Graphics – 2D	1	0	3	40	60	100	3
5	HSMC	COM101	English Communication	2	0	0	40	60	100	2
6	LC	BME121	Workshop Practices	0	0	4	60	40	100	2
7	LC	BTC121	Engineering Chemistry Laboratory	0	0	2	30	20	50	1
8	LC	BCS121	Programming for Problem Solving Laboratory	0	0	2	30	20	50	1
9	LC	COM121	English Communication Lab	0	0	2	30	20	50	1
10.	HSMC	ENV001	Environmental Science	2	0	0	40	0	40	S/US (Non-Credit)
<b>Total</b>							<b>390</b>	<b>400</b>	<b>790</b>	<b>21</b>

Semester II (First Year) (Group A)											
S.No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution			Credits	
				L	T	P	Internal	External	Total		
1	BSC	BTP102	Semiconductor Physics	3	1	0	40	60	100	4	
2	BSC	BTM201	Calculus, Ordinary Differential Equations and Complex Variables	3	1	0	40	60	100	4	
3	ESC	BEE101	Basic Electrical and Electronics Engineering	3	1	0	40	60	100	4	
4	ESC	BME201	Engineering Drawing & Graphics – 3D	1	0	3	40	60	100	3	
5	HSMC	COM201	Business Communication	2	0	0	40	60	100	2	
6	LC	BME122	Manufacturing Practices	0	0	4	60	40	100	2	
7	LC	BTP122	Semiconductor Physics Laboratory	0	0	2	30	20	50	1	
8	LC	BEE121	Basic Electrical and Electronics Engineering Laboratory	0	0	2	30	20	50	1	
9	LC	COM221	Business Communication Lab	0	0	2	30	20	50	1	
10.	MC	BMC001	Constitution of India	2	0	0	40	0	40	S/US (Non-Credit)	
<b>Total</b>							<b>390</b>	<b>400</b>	<b>790</b>	<b>22</b>	

**Note:** The course structure for semester first and second is given for group A.

In case of group B, courses in semesters first and second will be flipped with courses in semester second and first respectively.

## Semester III (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits	
				L	T	P	Internal	External			
1	Basic Science Course	BTM301	Transform & Discrete Mathematics	3	1	0	40	60	100	4	
2	Engineering Science course	BCS301	Object Oriented Programming	3	0	0	40	60	100	3	
3	Engineering Science course	BEE302	Digital Electronics	3	0	0	40	60	100	3	
4	Professional Core Courses	BRE301	Computer Aided Design-I	2	0	0	40	60	100	2	
5	Professional Core Courses	BRE302	Electronic Devices	3	0	0	40	60	100	3	
6	Laboratory Course	BCS321	Object Oriented Programming Lab	0	0	2	30	20	50	1	
7	Laboratory Course	BEE322	Digital Electronics Lab	0	0	2	30	20	50	1	
8	Laboratory Course	BRE321	Computer Aided Design-I Lab	0	0	4	60	40	100	2	
9	Laboratory Course	BRE322	Electronic Devices Lab	0	0	2	30	20	50	1	
10	PROJ	BRE300	Summer Training*	0	0	20	60	40	100	S/US	
<b>Total</b>							<b>410</b>	<b>440</b>	<b>850</b>	<b>20</b>	

\*NOTE: The students will take 6weeks (120 hours) summer training after 2<sup>nd</sup> semester. The evaluation of this summer training will be done in the 3<sup>rd</sup> semester.

## Semester IV (Second year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Engineering Science course	BEE402	Analog Circuits	3	0	0	40	60	100	3
2	Professional Core Courses	BRE401	Strength of Material	3	1	0	40	60	100	4
3	Professional Core Courses	BRE402	Control System Engineering	3	0	0	40	60	100	3
4	Professional Core Courses	BRE403	Computer Aided Design-II	2	0	0	40	60	100	2
5	Professional Elective Courses		Elective-I	3	0	0	40	60	100	3
6	Laboratory Course	BEE422	Analog Circuits Laboratory	0	0	2	30	20	50	1
7	Laboratory Course	BRE421	Strength of Material Laboratory	0	0	2	30	20	50	1
8	Laboratory Course	BRE422	Control System Engineering Laboratory	0	0	2	30	20	50	1
9	Laboratory Course	BRE423	Computer Aided Design-II Laboratory	0	0	4	60	40	100	2
10	Laboratory Course		Elective-I Laboratory	0	0	2	30	20	50	1
<b>Total</b>							<b>380</b>	<b>420</b>	<b>800</b>	<b>21</b>

## Semester V (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BRE501	Kinematics and Theory of Machines	3	1	0	40	60	100	4
2	Professional Core Courses	BRE502	Electrical Machines and Power Systems	3	1	0	40	60	100	4
3	Professional Core Courses	BRE503	Computer Integrated Manufacturing System	2	0	0	40	60	100	2
4	Professional Core Courses	BRE504	Manufacturing Processes	3	0	0	40	60	100	3
5	Professional Elective Courses		Elective-II	3	0	0	40	60	100	3
6	Laboratory Course	BRE521	Kinematics and Theory of Machines Laboratory	0	0	2	30	20	50	1
7	Laboratory Course	BRE522	Electrical Machines and Power Systems Lab	0	0	2	30	20	50	1
8	Laboratory Course	BRE523	Computer Integrated Manufacturing System Lab	0	0	4	60	40	100	2
9	Laboratory Course	BRE524	Manufacturing Processes Laboratory	0	0	2	30	20	50	1
10	Laboratory Course		Elective-II Laboratory	0	0	2	30	20	50	1
11	PROJ	BRE500	Software/Industrial Training	0	0	20	60	40	100	2
12	Mandatory Course	BMC003	Essence of Indian Traditional Knowledge	2	0	0	40	0	40	S/US
<b>Total</b>							<b>480</b>	<b>460</b>	<b>940</b>	<b>24</b>

\* NOTE: The students will take 6 weeks (120 hours) Software/Industrial training after semester 4th. The evaluation of this Software/Industrial training will be done in the 5<sup>th</sup> semester.

## Semester VI (Third year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BRE601	Robot Kinematics and Dynamics	3	1	0	40	60	100	4
2	Professional Core Courses	BRE602	PLC Programming	3	1	0	40	60	100	4
3	Professional Elective Courses		Elective-III	3	0	0	40	60	100	3
4	Professional Elective Courses		Elective-IV	3	0	0	40	60	100	3
5	Open Elective Courses		Open Elective-I	3	0	0	40	60	100	3
6	Humanities & Social Sciences including Management courses		Humanities	3	0	0	40	60	100	3
7	Laboratory Course	BRE621	Robot Kinematics and Dynamics Laboratory	0	0	2	30	20	50	1
8	Laboratory Course	BRE622	PLC Programming Laboratory	0	0	2	30	20	50	1
9			Elective-III Laboratory	0	0	2	30	20	50	1
<b>Total</b>							<b>330</b>	<b>420</b>	<b>750</b>	<b>23</b>

## Semester VII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Core Courses	BRE701	Computer Aided Manufacturing	3	1	0	40	60	100	4
2	Professional Core Courses	BRE702	Product Lifecycle Management	3	0	0	40	60	100	3
3	Professional Elective Courses		Elective-V	3	0	0	40	60	100	3
4	Professional Elective Courses		Elective-VI	3	0	0	40	60	100	3
5	Open Elective Courses		Open Elective-II	3	0	0	40	60	100	3
6	Humanities & Social Sciences including Management courses		Humanities	3	0	0	40	60	100	3
7	Laboratory Course	BRE721	Computer Aided Manufacturing Laboratory	0	0	2	30	20	50	1
8	Laboratory Course	BRE722	Product Lifecycle Management Laboratory	0	0	2	30	20	50	1
<b>Total</b>							<b>300</b>	<b>400</b>	<b>700</b>	<b>21</b>

## Semester VIII (Fourth year)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	Professional Elective Courses		Elective-VII	3	0	0	40	60	100	3
2	Open Elective Courses		Open Elective-III	3	0	0	40	60	100	3
3	PROJ	BRE800	Project-III	0	0	12	100	100	200	6
<b>Total</b>							<b>180</b>	<b>220</b>	<b>400</b>	<b>12</b>

## List of Professional Core Elective Courses

## Elective-I (Semester-4)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BRE441	Micro-controller and Micro-processor	3	0	0	3	3
2	PEC	BRE442	Automobile Engineering	3	0	0	3	3
3	PEC	BRE443	Data Structures and Algorithms	3	0	0	3	3
4	PEC	BRE424	Micro-controller and Micro-processor Laboratory	0	0	2	2	1
5	PEC	BRE425	Automobile Engineering Laboratory	0	0	2	2	1
6	PEC	BRE426	Data Structures and Algorithms Laboratory	0	0	2	2	1

## Elective-II (Semester-5)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BRE541	Fluid Systems	3	0	0	0	3
2	PEC	BRE542	Numerical Methods	3	0	0	0	3
3	PEC	BRE543	Data Communication and Networks	3	0	0	0	3
4	PEC	BRE525	Fluid Systems Laboratory	0	0	2	2	1
5	PEC	BRE526	Numerical Methods Laboratory	0	0	2	2	1
6	PEC	BRE527	Data Communication and Networks Laboratory	0	0	2	2	1

## Elective-III (Semester-5)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BRE544	Renewable Energy	3	0	0	3	3
2	PEC	BRE545	Non – Traditional Machining	3	0	0	3	3
3	PEC	BRE546	Power Plant Engineering	3	0	0	3	3

## Elective-IV (Semester-6)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BRE641	Additive Manufacturing	3	0	0	3	3
2	PEC	BRE642	Metrology and Quality Assurance	3	0	0	3	3
3	PEC	BRE643	Advanced Microprocessors And Microcontrollers	3	0	0	3	3
4	PEC	BRE623	Additive Manufacturing Laboratory	0	0	2	2	1
5	PEC	BRE624	Metrology and Quality Assurance Laboratory	0	0	2	2	1
6	PEC	BRE625	Advanced Microprocessors And Microcontrollers Laboratory	0	0	2	2	1

## Elective-V (Semester-7)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BRE741	Non Destructive Testing	3	0	0	3	3
2	PEC	BRE742	Industrial Safety	3	0	0	3	3
3	PEC	BRE743	Operations Research	3	0	0	3	3
4	PEC	BRE744	Reliability and Quality Control	3	0	0	3	3

## Elective-VI (Semester-7)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BRE745	Flexible Manufacturing System	3	0	0	3	3
2	PEC	BRE746	Industrial Robotics	3	0	0	3	3
3	PEC	BRE747	Disaster Management	3	0	0	3	3
4	PEC	BRE748	Process Planning and Cost Estimation	3	0	0	3	3

## Elective-VII (Semester-8)

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	PEC	BRE841	Machine Vision and Image Processing	3	0	0	3	3
2	PEC	BRE842	Internet of Things	3	0	0	3	3
3	PEC	BRE843	Material Handling Systems	3	0	0	3	3

## List of Humanities &amp; Social Sciences including Management Courses:

Sr. No.	Category	Course Code	Course Title	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	HSMC	COM101	English Communication	2	0	0	2	2
2	HSMC	COM121	English Communication Lab	0	0	2	2	1
3	HSMC	COM201	Business Communication	2	0	0	2	2
4	HSMC	COM221	Business Communication Lab	0	0	2	2	1
5	HSMC	HRM001	Human Resource Management	3	0	0	3	3
6	HSMC	TQM001	Total Quality Management	3	0	0	3	3
7	HSMC	HBW001	Human Behavior at Work	3	0	0	3	3
8	HSMC	INP001	Industrial Psychology	3	0	0	3	3
9	HSMC	ENV001	Environmental Science	2	0	0	2	S/US

## LIST OF OPEN ELECTIVE COURSES

Course Code	Course Title	L	T	P	Cr
BME032	Industrial Ergonomics	3	0	0	3
BME033	Introduction to Hydraulics and Pneumatics	3	0	0	3
BME034	Basic Thermodynamics and Heat Transfer	3	0	0	3
BME035	Energy Conservation	3	0	0	3
BME036	Solar Energy Utilization	3	0	0	3
BME037	Material Handling System	3	0	0	3
BME038	Production and Operation management	3	0	0	3
BME039	Safety and Hazard Analysis	3	0	0	3
BMA031	Entrepreneurship	3	0	0	3
BMA032	Operations Management	3	0	0	3
BMA033	Management Information System	3	0	0	3
BMA034	Basics of CAD	2	0	2	3
BMA035	Basics of Additive Manufacturing	2	0	2	3
BEE031	Simulation and Modelling	1	0	4	3
BEE032	Industrial Robotics and control	3	0	0	3
BEE033	Network Securities	3	0	0	3
BEE034	Artificial Intelligence	3	0	0	3
BEE035	PLC and SCADA	3	0	0	3
BEE036	Internet of Things	3	0	0	3
BEE037	Biomedical Instrumentation	3	0	0	3
BEE038	Nanoelectronics	3	0	0	3
BEE039	Composite Materials	3	0	0	3
BAE031	Introduction to Aerospace Engineering	3	0	0	3
BAE032	Aircraft Materials	3	0	0	3
QMD031	Quantitative methods for decision making	3	0	0	3
VAE 031	Values and Ethics	3	0	0	3
EPI 031	Economic Policies in India	3	0	0	3
FME 031	Fundamentals of Management for Engineers	3	0	0	3
BCS041	Basics of Python Programming	2	0	2	3
BCS042	Introduction to Linux and Shell Programming	2	0	2	3
BCS 043	Basics of Web Technologies	2	0	2	3
BCE031	Water pollution and its management	3	0	0	3
BCE032	Global warming and Climate Change	3	0	0	3
BCE033	Disaster Management and Mitigation	3	0	0	3
BCE034	Soil Chemistry and its impact	3	0	0	3
BCE035	Energy engineering technological and management	3	0	0	3
BCE036	Renewable energy technology	3	0	0	3
BCE037	Industrial pollution prevention and control	3	0	0	3
BCE038	Numerical methods of Engineering	3	0	0	3

## List of Courses for B. Tech Robotics and Automation Engineering (Honours)

Sr. No.	Course Code	Course Title	Semester	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	BRE404	Virtual Reality Systems and Applications	IV	4	0	0	4	4
2	BRE505	Artificial Intelligences in Robotics	V	4	0	0	4	4
3	BRE603	Neural Networks and Fuzzy Systems	VI	4	0	0	4	4
4	BRE603	Advanced PLC and SCADA Programming	VII	4	0	0	4	4
5	BRE803	Computer Integrated Manufacturing Systems	VIII	4	0	0	4	4

## B.Tech with Minor Degree in Robotics

Sr. No.	Course Code	Course Title	Semester	Hours per Week			Total Contact Hours	Credits
				L	T	P		
1	BEE302	Digital Electronics	3 <sup>rd</sup>	3	0	0	3	3
2	BEE322	Digital Electronics Laboratory	3 <sup>rd</sup>	0	0	2	1	2
3	BRE405	Robotics and Control	4 <sup>th</sup>	3	0	0	3	3
4	BRE427	Robotics and Control Laboratory	4 <sup>th</sup>	0	0	2	1	2
5	BRE541	Fluid System	5 <sup>th</sup>	3	0	0	3	3
6	BRE525	Fluid System Laboratory	5 <sup>th</sup>	0	0	2	1	2
7	BRE601	Robot Kinematics and Dynamics	6 <sup>th</sup>	3	0	0	3	3
8	BRE621	Robot Kinematics and Dynamics Laboratory	6 <sup>th</sup>	0	0	2	1	2
9	BRE702	Product Lifecycle Management	7 <sup>th</sup>	3	0	0	3	3
10	BRE722	Product Lifecycle Management Laboratory	7 <sup>th</sup>	0	0	2	1	2

Total Credits: 25

## B.Tech with Minor in Automation Engineering

Sr. No.	Course Code	Course Title	Semester	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	BMA441	Micro Controller And Microprocessor	4 <sup>th</sup>	3	0	0	40	60	100	3
2	BMA424	Micro Controller And Microprocessor Laboratory	4 <sup>th</sup>	0	0	2	30	20	50	1
3	BMA541	Fluid Systems	5 <sup>th</sup>	3	0	0	40	60	100	3
4	BMA525	Fluid Systems Laboratory	5 <sup>th</sup>	0	0	2	30	20	50	1
5	BRE602	PLC Programming	6 <sup>th</sup>	3	1	0	40	60	100	4
6	BRE622	PLC Programming Laboratory	6 <sup>th</sup>	0	0	2	30	20	50	1
7	BMA701	Computer Aided Engineering	7 <sup>th</sup>	3	1	0	40	60	100	4
8	BMA721	Computer Aided Engineering Laboratory	7 <sup>th</sup>	0	0	2	30	20	50	1
9	BMA841	Computer Aided Manufacturing	8 <sup>th</sup>	3	0	0	40	60	100	3
10	BMA821	Computer Aided Manufacturing Laboratory	8 <sup>th</sup>	0	0	2	30	20	50	1

Total Credits: 22

## SUMMARY OF CREDIT DISTRIBUTION

Sr. No.	Category	Credits Per Semester								Credits
		I	II	III	IV	V	VI	VII	VIII	
1	BSC	9	9	4	0	0	0	0	0	22
2	ESC	9	10	8	4	0	0	0	0	31
3	PCC	0	0	8	13	18	8	9	0	58
4	PEC	0	0	0	4	4	3	6	3	24
5	HSMC	3	3	0	0	0	3	3	0	12
6	OE	0	0	0	0	0	6	3	3	9
7	PROJECT	0	0	2	0	2	0	0	6	10
	<b>TOTAL</b>	<b>21</b>	<b>22</b>	<b>20</b>	<b>21</b>	<b>24</b>	<b>23</b>	<b>21</b>	<b>12</b>	<b>164</b>



**D. Summer Training:**

- Summer training is a core course, to be done typically during the summer vacations. A student should undergo summer training for 4-6 weeks, starting after year 3<sup>rd</sup>, preferably in an industry, R & D institutions or in an academic institution is of repute permitted. Training of 4<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 5<sup>th</sup> semester.
- It is the responsibility of the Corporate Relations Department (CRD) to arrange training for all the students. In the beginning of each academic session, Corporate Relations Department will prepare a program wise list of potential training organizations. These organizations will be approached by the Corporate Relations Department with a request to provide training seats. Consolidated lists of training offers will be made available to the eligible students in the beginning of even semester of the session. If a student is interested in making his/her own arrangement for the training seat, he/she will need to have the training organization approved by routing the application to the Dean of B.Tech. Robotics and Automation Engineering for approval.
- The students will be required to get their training activity and results reviewed by organization in which they have attended the training. Each Faculty shall nominate training coordinator from amongst the faculty members. The faculty will scrutinize the training report and the certificate issued by the corporate and will award a satisfactory/unsatisfactory grade, which must be sent to the controller of examination office within one month of commencement of next semester. In case the training is considered to be unsatisfactory, an 'Unsatisfactory' grade will be awarded and the student shall have to undergo fresh summer training in part or full duration as decided by the Dean of B.Tech. Mechanical and Automation Engineering. The summer training, submission of training report and obtaining satisfactory grade is mandatory requirement for award of B.Tech RAE degree.

**E. Industry Exposure Program:**

A student should undergo industrial training for 4-6 weeks, starting after year 3<sup>rd</sup>, preferably in an industry, R & D institutions or in an academic institution is of repute permitted. Training of 4<sup>th</sup> semester shall be graded and is essential part of the degree requirement in 5<sup>th</sup> semester. This industry exposure program is compulsory and an integral part of the Program. The Placement Office will assist the students in finding suitable summer assignments / projects.

The industrial training aims at achieving the following objectives:

- (a) Application of knowledge and techniques learnt in the first and second year to real life situation and make them better prepared to enrich their learning in the upcoming semesters.
- (b) Appreciating the inter-linkage among different functions and developing a realistic perspective about organizations in their totality. The students should take the industrial training seriously. They are expected to diligently in the job. A faculty member will work closely with the company to define the scope of the industrial training and ensure proper understanding of the terms of engagement by all concerned. The student should be ready to not only learn from the followed practices in the Industry but also present a professional front i.e. being punctual at the workplace, well behaved and appropriately dressed. At the end of the training, the student should submit a brief report explaining briefly the key learning points and the insights gained. A 'certificate of completion' from the host organization is essential. The Industry training shall be credited as approved in the curricula. The industrial training, submission of training report and obtaining satisfactory grade is mandatory requirement for award of B.Tech RAE degree.

## BACHELOR OF DESIGN IN AUTOMOTIVE AND PRODUCT DESIGN

### A. Program Outcomes:

- PO1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 Design/development of solutions:** 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.
- PO4 Conduct investigations of complex problems:** 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.
- PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- PO6 The engineer and society:** 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.
- PO7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge, and need for sustainable development.
- PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 Communication:** 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.

- PO11 Project management and finance:** 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.
- PO12 Life-long learning:** 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.

### B. Program Specific Outcomes:

- PSO1** Present the design and communicate well in front of concerned members of the organization.
- PSO2** Create an ethical and sustainable design.
- PSO3** Add value to every business decision with a holistic approach.

### C. Program Structure: As per GNA University

Details of Courses under Bachelor of Design in Automotive and Product Design		
Course		*Credits
<b>I. Core Course</b>		
(25 subjects)		
Theory (7 subjects)		
Theory + Practical (16 subjects)		
Practical (2 subjects)		
<b>II. Elective Course</b>		
1. Discipline Elective Course (4 subjects)	16	
Theory + Practical [4X4= 16]		
2. General Elective (3 Papers)	12	
Theory + Practical [3X4= 12]		
<b>III. Ability Enhancement Courses</b>		
<b>1. Ability Enhancement Compulsory</b>	<b>08</b>	
<b>2. Skill Enhancement Course (4 Courses)</b>		
THEORY	8	
PRACTICAL	5	
TUTORIAL	3	16
<b>IV. Museum &amp; Industrial Visit</b>	02	02
<b>V. Social work (50 hrs)</b>	02	02
<b>VI. Design Seminar</b>	03	03
<b>VII. Final Project</b>	25	25
<b>Total credits</b>		<b>165</b>

## COURSE STRUCTURE

## A) Core Courses

Sr. No.	Pre-requisite	Course Code	Course Title
C1		APD101	History of Design
C2		APD102	Basics of Sketching
C3		APD103	Automotive Basics and Mechanics
C4		APD104	Colour Theory
C5		APD105	Elements of Design
C6		APD106	Engineering Drawing
C7		APD107	Design Trends
C8		APD108	Introduction to Digital Sketching
C9		APD109	Product Design Process
C10	APD103	APD201	Automotive & Product Materials
C11		APD202	Manufacturing Processes
C12		APD203	Product Design Modeling I
C13	APD108	APD204	Digital Sketching & Rendering
C14		APD205	Design Research
C15	APD203	APD206	Product Design Modeling II
C16		APD207	Clay Modeling I
C17		APD301	Digital Surfacing I
C18	APD207	APD302	Clay Modeling II
C19	APD301	APD303	Digital Surfacing II
C20	APD206 APD303	APD304	3D Model Rendering
C21	APD109 APD201	APD305	Design Project I
C22	APD109 APD201	APD306	Design Project II
C23	APD109 APD201	APD307	Design Project III
C24	APD109 APD201	APD308	Design Project IV
C25		APD116	Graphic Design & Portfolio Design
C26		APD117	Design Seminar
C27			Industrial Visit
C28			Social Work
C29		APD411	Graduation Project

## B) Ability Enhanced Compulsory Courses (AECC)

Sr. No.	Pre-requisite	Course Code	Course Title
AECC1	N.A	COM101	English Communication
		COM121	English Communication Lab
AECC2	COM101	COM201	Business Communication
	COM121	COM221	Business Communication Lab
AECC3	N.A	ENS001	Environmental Studies

## C) Skill Enhanced Course (SEC) (Credit: 04 each)

Sr. No.	Pre-requisite	Course Code	Course Title
SEC1	APD102	APD111	Organic Sketching in Product Design
SEC2		APD112	Ergonomics and Packaging
SEC3		APD113	Aerodynamics and Safety Regulations
SEC4		APD114	CMF - Colour Material & Finish

## D) Discipline Specific Elective (DSE) (Credit: 04 each)

Pre-requisite	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
N.A	APD121	Car design sketching I	1	1	4	4
N.A	APD122	Bike design sketching I	1	1	4	4
N.A	APD123	Interior Sketching I	1	1	4	4
N.A	APD124	Product design detailing I	1	1	4	4
APD121	APD221	Car design sketching II	1	1	4	4
APD122	APD222	Bike design sketching II	1	1	4	4
APD123	APD223	Interior Sketching II	1	1	4	4
APD124	APD224	Product design detailing II	1	1	4	4

## E) Generic Electives: As Applicable

Pre-requisite	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
N.A	APD125	Furniture Design	1	1	4	4
N.A	APD126	Toy Design	1	1	4	4
N.A	APD127	Social Project	1	1	4	4
N.A	APD128	Narrative Skills & Story Boarding	1	1	4	4
N.A	APD129	Design of Everyday Object	1	1	4	4
N.A	APD130	Sci Fi Project Year 2050	1	1	4	4
N.A	APD131	Smart Product Design	1	1	4	4
N.A	APD132	Yacht Design	1	1	4	4
N.A	APD133	Mass Transport Design	1	1	4	4
N.A	APD134	3 Wheeler Design	1	1	4	4

## Course Scheme for B. Des Automotive and Product Design

## Semester I

Sr. No.	Pre-requisite	Course Code	Course Title	Hours per Week			Credits
				L	T	P	
1	N.A	APD101	History of Design	2	0	0	2
2	N.A	APD102	Basics of Sketching	1	1	2	3
3	N.A	APD103	Automotive Basics And Mechanics	2	1	0	3
4	N.A	APD104	Colour Theory	1	0	4	3
5	N.A	APD105	Elements of Design	2	1	4	5
6	N.A	COM101	English Communication	2	0	0	2
7	N.A	COM121	English Communication Lab	0	0	2	1
<b>Total:</b>				<b>25</b>			<b>19</b>

## Semester II

Sr. No.	Pre-requisite	Course Code	Course Title	Hours per Week			Credits
				L	T	P	
1	N.A	APD106	Engineering Drawing	1	0	4	3
2	N.A	APD107	Design Trends	2	0	0	2
3	N.A	APD108	Introduction to Digital Sketching	1	0	2	2
4	N.A	APD109	Product Design Process	3	0	0	3
5	APD102	APD111	Organic Sketching In Product Design	1	0	6	4
6	N.A	ENS001	Environmental Studies	2	0	0	2
7	COM101	COM201	Business Communication	2	0	0	2
8	COM121	COM221	Business Communication Lab	0	0	2	1
<b>Total:</b>				<b>26</b>			<b>19</b>

## Semester III

Sr. No.	Pre-requisite	Course Code	Course Title	Hours per Week			Credits
				L	T	P	
1	APD103	APD201	Automotive & Product Materials	2	1	0	3
2	N.A	APD202	Manufacturing Processes	0	0	6	3
3	N.A	APD203	Product Design Modeling I	1	0	4	3
4	APD108	APD204	Digital Sketching & Rendering	1	0	4	3
	APD109 APD201	APD305	Design Project I	2	1	4	5
5	N.A	APD002	Social Work	0	0	4	2
<b>Total:</b>				<b>30</b>			<b>19</b>

## Semester IV

Sr. No.	Pre-requisite	Course Code	Course Title	Hours per Week			Credits
				L	T	P	
1	N.A	APD205	Design Research	1	1	0	2
2	APD203	APD206	Product Design Modeling II	1	0	4	3
3	N.A	APD207	Clay Modeling I	0	0	4	2
4	N.A	APD112	Ergonomics And Packaging	2	1	2	4
5			DSE-1	1	1	4	4
6	APD109 APD201	APD306	Design Project II	2	1	4	5
<b>Total:</b>				<b>29</b>			<b>20</b>

## Semester VI

Sr. No.	Pre-requisite	Course Code	Course Title	Hours per Week			Credits
				L	T	P	
1	APD301	APD303	Digital Surfacing II	1	0	4	3
2	APD206 APD303	APD304	3D Model Rendering	1	0	4	3
3			Industrial Visit				2
4			DSE-3	1	1	4	4
5			GE-2	1	1	4	4
6	APD109 APD201	APD307	Design Project III	2	1	4	5
<b>Total:</b>				<b>29</b>			<b>21</b>

## Semester V

Sr. No.	Pre-requisite	Course Code	Course Title	Hours per Week			Credits
				L	T	P	
1	N.A	APD301	Digital Surfacing I	1	0	4	3
2		APD116	Graphic Design & Portfolio Design	2	2	0	4
3	APD207	APD302	Clay Modeling II	2	0	2	3
4			DSE-2	1	1	4	4
5			GE-1	1	1	4	4
6	N.A.	APD114	CMF- Colour Material & Finish	2	1	2	4
<b>Total:</b>				<b>30</b>			<b>22</b>

## Semester VII

Sr. No.	Pre-requisite	Course Code	Course Title	Hours per Week			Credits
				L	T	P	
1	APD115	APD113	Aerodynamics & Safety Regulations	2	2	0	4
2			DSE-4	1	1	4	4
3			GE 3	1	1	4	4
4	APD109 APD201	APD308	Design Project IV	2	1	4	5
5		APD117	Design Seminar	-	-	-	3
<b>Total:</b>				<b>23</b>			<b>20</b>

Semester VIII

Sr. No.	Pre-requisite	Course Code	Course Title	Hours per Week			Credits
				L	T	P	
1		APD119	Graduation Project	-	-	-	25
<b>Total:</b>							<b>25</b>

Semester	Core Course (CC) (4)	Ability Enhancement Course (AECC) (4)	Skill Enhancement Course (SEC) (4)	Discipline Specific Elective (DSE) (4)	Generic Elective (GE) -4
I	CC1	AECC 1			
	CC2				
	CC3				
	CC4				
	CC5				
II	CC6	AECC 2 & AECC 3	SEC 1		
	CC7				
	CC8				
	CC9				
III	CC10				
	CC11				
	CC12				
	CC13				
	CC21				
IV	CC28		SEC 2	DSE 1	
	CC14				
	CC15				
	CC16				
V	CC22			DSE 2	GE1
	CC17				
	CC18				
		INDUSTRIAL VISIT			
VI	CC25			DSE 3	GE2
	CC19				
	CC20				
	CC23		SEC 3	DSE 4	GE3
	CC24				
VII	CC26				
	CC29				

**D. Industrial Visit:**

A student should undergo industrial visit for 3 days during semester 6<sup>th</sup>, preferably in an industry, R & D institutions. This industrial visit is compulsory and an integral part of the Program. The Placement Office will assist the students in finding suitable Industrial visit.

The industrial visit aims at achieving the following objectives:

- (a) Application of knowledge and techniques learnt in the first and second year to real life situation and make them better prepared to enrich their learning in the upcoming semesters.
- (b) Appreciating the inter-linkage among different functions and developing a realistic perspective about organizations in their totality. The students should take the industrial training seriously. They are expected to diligently in the job. A faculty member will work closely with the company to define the scope of the industrial training and ensure proper understanding of the terms of engagement by all concerned. The student should be ready to not only learn from the followed practices in the Industry but also present a professional front i.e. being punctual at the workplace, well behaved and appropriately dressed. At the end of the training, the student should submit a brief report explaining briefly the key learning points and the insights gained. A 'certificate of completion' from the host organization is essential. The Industry training shall be credited as approved in the curricula.

**E. Graduating Project:**

- Graduating project is a core course, to be done typically during the 8<sup>th</sup> semester. A student should undergo graduating project for 18-20 weeks, starting after year 4<sup>th</sup>, preferably in an industry, R & D institutions or in an academic institution is of repute permitted. Graduating project of 8<sup>th</sup> semester shall be graded and is essential part of the degree requirement.
- It is the responsibility of the Corporate Relations Department (CRD) to arrange training for all the students. In the beginning of each academic session, Corporate Relations Department will prepare a program wise list of potential training organizations. These organizations will be approached by the Corporate Relations Department with a request to provide training seats. Consolidated lists of training offers will be made available to the eligible students in the beginning of even semester of the session. If a student is interested in making his/her own arrangement for the training seat, he/she will need to have the training organization approved by routing the application to the Dean of Bachelor of Design Automotive and Product Design for approval.
- The students will be required to get their graduating project and results reviewed by organization in which they have attended the project. Each Faculty shall nominate training coordinator from amongst the faculty members. The faculty will scrutinize the graduating project and the certificate issued by the corporate and will award a satisfactory/unsatisfactory grade, which must be sent to the controller of examination office within one month of commencement of next semester. In case the project is considered to be unsatisfactory, an 'Unsatisfactory' grade will be awarded and the student shall have to undergo fresh summer training in part or full duration as decided by the Dean of B Bachelor of Design Automotive and Product Design. The graduating project, submission of project and obtaining satisfactory grade is mandatory requirement for award of Bachelor of Design Automotive and Product Design degree.

**6 Medium of Instructions for Engineering Programs:**

- a. The medium of instructions and examination will be English.
- b. Practical work/Project Work / Project Report / Dissertation / Field Work Report / Training Report etc., if any, should be presented in English.

**7. Mode for Engineering Programs:** The programs are offered in 'Full Time' mode of study only.**8 Attendance Requirement to be Eligible to Appear in End Semester Examination:**

- 8.1** Every student is required to attend at least 75% of the lectures delivered squaring tutorials, practical and other prescribed curricular and co-curricular activities.
  - 8.2** Dean of Faculty may give a further relaxation of attendance up to 5% to a student provided that he/she has been absent with prior permission of the Dean of the Faculty for the reasons acceptable to him/her.
  - 8.3** Further, relaxation up to 10% may be given by the Vice Chancellor to make a student eligible under special circumstances only.
  - 8.4** No student will be allowed to appear in the end semester examination if he/she does not satisfy the attendance requirements. Further, the attendance shall be counted from the date of admission in the University or commencement of academic session whichever is later.
  - 8.5** Attendance of N.C.C/N.S.S. Camps or Inter collegiate or Inter University or Inter State or International matches or debates or Educational Excursion or such other Inter University activities as approved by the authorities involving journeys outside the city in which the college is situated will not to be counted as absence. However, such absence shall not exceed four weeks per semester of the total period of instructions. Such facility should not be availed twice during the course of study.
- 9. Credit:** A unit by which the course is measured. It determines the number of hours of instruction required per week.
- Each course, except a few special audit courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and/or laboratory contact hours in a week.
- A letter grade, corresponding to specified number of grade points, is awarded in each course for which a student is registered. On obtaining a pass grade, the student accumulates the course credits as earned credits. A student's performance is measured by

the number of credits that he/she has earned and by the weighted grade point average. A minimum number of credits should be acquired to qualify for the programs.

**Earned Credits (EC):** The credits assigned to a course in which a student has obtained 'D' (minimum passing grade) or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained F, or W or "I" grade will not be counted towards his/her earned credits.

Contact Hours per Week	Credit Assigned
1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
2 Hours Practical (Lab) per week	1 credit

**10. Examination/Evaluation System:** The evaluation system of the University shall be oriented to encourage the academic qualities. The University follows two components to evaluate student's performance:

**10.1. Internal Assessment:** which includes attendance, mid semester examination and other components (Project 1, Project 2, Mid Term Exam, Attendance, Class Test) carrying a weightage of 40%. This is applicable for all theory courses.

**10.2. Practical Courses:**

- a) The examination/evaluation criteria of the practical courses shall be decided by the respective faculty member and wherever required on the availability of the external experts/visiting faculty. Faculty may set/design the practical exercises out of any marks but the overall weightage shall be in pre-defined percentage, which the concerned faculty/course coordinator shall announce in the first class of the semester and upload on the GU-MS. Methodology for evaluation of Lab component may include day to day work, lab records, quantity/quality of work and Viva/Seminar/Practical as may be decided.
- b) Internal Assessment of practical's i.e. Practical Lab Continuous Assessment, carrying a weightage of 60%

**10.3. External Assessment:**

- a) External Assessment of practical's i.e., Practical Lab External, carrying a weightage of 40%.



- b) End Semester Examination:** These examinations shall be conducted under Controller of Examination. The examination dates and schedule shall be released by the University's Controller of Examination.
- c)** Similar division of marks may be created for special courses like Major Projects, seminars, term papers, internship etc. by respective faculty but same shall also be predefined.
- d)** Every student has to score at least 25% marks each in Continuous Assessment and End Semester examination. The minimum pass percentage is 40% in aggregate. In case a student scores more than 25% each in Continuous Assessment and End Semester Examination, but overall percentage in the concerned subject remains less than 40%, then student has to repeat End Semester Examination in that subject.

#### **10.4. Failing to meet Attendance Requirement:**

- a)** A student is required to attend all the classes.
- b)** If the attendance profile of a student is unsatisfactory, he/she will be debarred. Any student, who has been debarred due to attendance shortage, shall not be allowed to take the supplementary Examination. The student shall have to register for the course in the regular semester when offered.

**10.5. Make Up Examinations for Mid Semester Examination:** A student may apply for a makeup examination where he/she is not able to attend the examination schedule due to reasons of personal medical condition or compassionate reason like death of a very close relative. No other contingencies are acceptable. Except in case of medical emergency, a student needs to seek advance approval from appropriate authority before missing the Examination.

#### **Theory Courses:**

- A student missing Mid Term Examination only shall be required to take a make-up Examination.
- The students must put-up the request for make-up Examination along with the medical documents to prove the genuineness of the case (for having missed the Examination) within 5 days of last date of Examination.

- The genuineness shall be reviewed and approved by the Vice Chancellor, whose decision shall be final.
- In case a student misses the make-up Examination also, then no further chance will be provided.
- The duration of Examination shall be as decided by the Faculty member.
- Genuine approved cases shall be notified by the Controller of Examination based on the requests received and only such students shall be allowed to take make-up Examination in the subjects where approval has been granted.
- The date sheet need not be taken out as the makeup examination shall be conducted under arrangement concerned faculty, who after evaluation and sharing the evaluated answer sheet with student shall submit marks to the Controller of Examination.

**10.6. Makeup of End Semester Examination:** It is mandatory to appear the end semester major examination to obtain any grade for a course. A student who misses the end semester major examination shall follow a similar procedure as outlined above, to obtain approval of the Vice Chancellor to prove genuineness of the case. The student whose case is approved as genuine shall be awarded "I" Grade in the semester results in the given subject. The student shall be allowed to appear in the supplementary examination of the said subject. However, the grades shall be worked out by computing the marks obtained by students in Mid Term Exams, TA, Lab and supplementary examination (equated to the weightage of end semester examination). The total marks shall be compared with the marks of the class as in the regular semester for award of grade.

**10.7. Makeup of End Semester Viva of Projects:** It is mandatory to appear in the final Viva examination to obtain any grade for a project course. In case of student missing the same for genuine reasons; similar method as given for written examination of theory courses shall be followed.

**10.8. Procedure to be adopted by students in case of missing any of the specified Examination(s):** Following procedure shall be adopted for establishing genuineness of the case.

**a. Action by the student (Medical Cases)**

- I. They should report absence from the Examination(s) by fastest possible means to the Controller of Examination. It could be email or written communication by speed post or sent by hand through any means. In case of Hosteller's, if a student falls sick while residing in the hostel, he/she should seek advice of the available qualified doctor.
- II. The said report should preferably be sent prior to the Examination, but not later than 5 days after the last date of the said Examination.
- III. The student should on rejoining:
  - a. Report to the Controller of Examination with complete medical documents to include referral/Prescription slip of the doctor specifically indicating the disease and medicine prescribed, investigation/Lab reports and discharge slip in case of admission should be provided.
  - b. Submit the Documents to the Controller of Examination, not later than 5 days after the last date of Examination.

**b. Action by students (any other reason)**

In case the student miss Examination due to genuine reason other than medical, prior written sanction of Vice Chancellor and in his absence Dean is mandatory. No post facto requests shall be accepted in any case. The approval should be deposited with the Controller of Examination before the examination.

**11. Supplementary Examination:**

- 11.1. A Student can appear for reappear of even semester in even semester and for reappear of odd semester in odd semester of the following years of study. For the final semester students, there is privilege to appear in the supplementary exams of all pervious semester.
- 11.2. **Eligibility:** Student with 'F' grade is eligible to appear in the Supplementary Examination.
- 11.3. **Supplementary for Projects:** There shall be no supplementary examinations for the projects, except make up examination for missing the final viva as per rules outlined above.

**12. Grading System:** University follows eight letter grading system (A+, A, B+, B, C+, C, D, and F) that have grade points with values distributed on a 10 point scale for evaluating the performance of student. The letter grades and the corresponding grade points on the 10-point scale are as given in the table below.

Academic Performance	Range of Marks	Grades	Grade Points
Outstanding	≥90	A+	10
Excellent	≥80 & < 90	A	9
Very Good	≥70 & < 80	B+	8
Good	≥60 & < 70	B	7
Fair	≥50 & < 60	C+	6
Average	>40 & < 50	C	5
Minimally Acceptable	40	D	4
Fail	< 40	F	0
Incomplete		I	-
Withdrawal		W	-
Grade Awaited		GA	-
<b>S-Satisfactory, US-Unsatisfactory Minor Project</b>		<b>S/US</b>	

**12.1 Description of Grades:**

- A. D Grade:** The D grade stands for marginal performance, i.e. it is the minimum passing grade in any course.
- B. F Grade:** The 'F' grade denotes a very poor performance, i.e. failing a course. A student has to repeat all courses in which she/he obtains 'F' grade, until a passing grade is obtained. In the case of 'F', no Grade points are awarded. However, the credits of such courses shall be used as denominator for calculation of GPA or CGPA.

**C. W Grade:** The 'W' grade is awarded to a student if he/she is allowed to withdraw for an entire Semester from the University on medical grounds for a period exceeding five weeks.

**D. I' Grade:** The 'I' grade is awarded when the student is allowed additional opportunity like make up Examination etc. based on which the grade is to be decided along with other components of the evaluation during the semester. An incomplete grade of 'I' may be given when an unforeseen emergency prevents a student from completing the work in a course. The 'I' must be converted to a performance grade (A to F) within 90 days after the first day of classes in the subsequent regular semester.

**E. X Grade:** It is equivalent to Fail grade but awarded due to student falling below the laid down attendance requirement. Students having X grade shall be required to re-register for the course, when offered next.

**12.2. Cumulative Grade Point Average (CGPA),** it is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all Semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

NB: The CGPA can be converted to percentage by using the given formula:

$$\text{CGPA} \times 10 = \%$$

e.g.  $7.8 \times 10 = 78\%$

**12.3.** Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (Course title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

### 13. General Rules: Examinations for Engineering Programs:

- a) Showing the Answer Scripts: The answer scripts of all written Examinations i.e. Mid Term or end semester examination or any other written work conducted by a teacher shall be shown to the students. Students desirous of seeing the marked answer scripts of end Semester Examination, has to ensure their presence before results are declared, as per dates notified by the Controller of Examination.
- b) Marks/Answer Sheets of all other tests shall also be shared with the students and thus, there shall be no scrutiny of grades. However, before the grades are forwarded to Registrar/Controller of Examination, they should be displayed on GU-MS and time given to students, to discuss the same with respective faculty.
- c) No appeal shall be accepted for scrutiny of grades.
- d) Examination Fee for Supplementary. A fee of **Rs.1000/-** per course or as decided by the Management from time to time will be charged from the students.

**14. Improvement of overall Score:** A candidate having CGPA < 5.5 and wishes to improve his/her overall score may do so within two academic years immediately after passing the degree program by reappearing into maximum four course(s)/subject(s). The improvement would be considered if and only if the CGPA becomes > 5.5.

**15. Program qualifying criteria:** For qualifying the Program every student is required to earn prescribed:

Name of the Engineering Programs	Credits
B.TECH AEROSPACE ENGINEERING	i.e. 170
B.TECH CIVIL ENGINEERING	i.e. 164
B.TECH MECHATRONICS ENGINEERING	i.e. 168
B.TECH MECHANICAL ENGINEERING	i.e. 167
B.TECH COMPUTER SCIENCE ENGINEERING	i.e. 170
B.TECH ELECTRONICS & COMMUNICATION ENGINEERING	i.e. 164
B.TECH DESIGN IN AUTOMOTIVE AND PRODUCT DESIGN	i.e. 165
B.TECH. MECHANICAL AND AUTOMATION ENGINEERING	i.e. 166
B.TECH. ROBOTICS AND AUTOMATION ENGINEERING	i.e. 166

If any student fails to earn prescribed credits for the program then he/she will get a chance to complete his/her Program in two more years than the actual duration of degree.

**16. Revision of Regulations, Curriculum and Syllabi:** The University may revise, amend, change or update the Regulations, Curriculum, Syllabus and Scheme of examination through the Board of Studies and the Academic Council as and when required.

**17. Conditions for Award of a Degree:**

- a) Earning a minimum credit as specified in the curriculum of respective program. In case of lateral entry students (direct entry into second year) the minimum credits shall be equivalent to total credits for the program less the credits of first year. This excludes the credits required to be obtained by the student of lateral entry, who is advised to take some equivalence courses.
- b) Should complete the requirements of the Degree in maximum duration specified for the program. Semester withdrawals due to medical reasons are not counted in six years. However, forced withdrawal of students e.g. rustication or expulsion or nonattendance by student due to any other reasons, shall count in the maximum period of six years and minimum period of four years.

- c) Successfully completing the Internship studies.
- d) Should have cleared all the foundational and core courses of the programs. In case of lateral entry students (direct entry into second year) the student should have completed the foundational/core courses/equivalent courses, as approved at the time of admission in the programs.