Third Meeting of the Senate

March 24, 2018

Minutes of the Meeting

Indian Institute of Information Technology Vadodara

Minutes of the Third meeting of the Senate
24th March, 2018

The third meeting of the Senate was held on 24th March, 2018 at 10:30 am in Conference Room, IIIT Vadodara

The following members were present:

1. Prof. Sarat Kumar Patra, The Director of IIIT Vadodara, Chairperson
2. Prof. Surendra Prasad, IIT Delhi, Member
3. Prof. G Sivakumar, IIT Bombay, Member
4. Prof. Suman Mitra, Dean Academic Program, DA-IICT, Member
5. Prof. Sanjeev Gupta, Dean Research, DA-IICT, Member
6. Dr. K. Kesavasamy, Head, Academic Interface Programme, TCS, Member
7. Prof. Pratik Shah, IIIT Vadodara, Head of Department IT
8. Prof. Dhirendra Sinha, IIIT Vadodara, Head of Department Sciences and HSS
9. Prof. Jignesh Bhatt, IIIT Vadodara, Head of Department CSE
10. Col. Ravi Chugh, Registrar of IIIT Vadodara, Member Secretary

The following members could not attend the meeting

1. Prof. Pandu Rangan, IIT Madras, Member

He was granted leave of absence by the Chairperson.

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SEN:3-1 APPROVE THE MINUTES OF THE SECOND MEETING HELD ON 28th October 2017

The Minutes of the "Second Senate meeting" held on 28th October 2017 was circulated to all members. There were no correction/changes suggested by the members. The minutes have been thereafter approved by the Chairperson. The minutes were also placed in the 4th BoG meeting held on 5th December 2017 and were ratified.

Decision: *Senate NOTED and CONFIRMED the minutes of the second meeting of the senate.*

SEN:3-2 REVIEW OF THE ACTION TAKEN REPORT

Action Item No	Action Item	Action Taken
ITEM SEN:2-1	Creation of Alumni Cell	Implemented.
Senate NOTED the action taken.		
ITEM SEN:2-2	For admission batch 2013-14, the mark sheets be issued without any change.	Implemented.
	For admission batch 2014-15 and onwards the mark sheets must be revised, rectifying the error in SPI/ CPI calculations, and the same to be issued to students at the end of Autumn 2017-18 in the form of combined mark sheet of all previous semesters.	Implemented.
Senate NOTED the action taken.		
ITEM SEN:2-5	Revision of Policy on branch change based on the percentage of actual intake in place of sanctioned intake (existing policy)	Noted. The policy will be implemented in the Academic Year 2018-19.
Senate NOTED the action taken.		
ITEM SEN:2-7	Orientation program for Teaching Assistants at the time of registration. The same should be included in the academic calendar.	Implemented.
Senate NOTED the action taken.		
ITEM SEN:2-8	Duration of retaining the answer-scripts of mid semester and end semester examination	Implemented.
Senate Recommendations: 1. Senate recommends that the answer scripts for mid-semester and end-semester examination should be preserved for twelve months duration after the declaration of the results of the corresponding semester. 2. Senate also recommends that the guidelines for grievance resolution be communicated to all students and faculty and to be included in the UG Student Manual.		

ITEM SEN:2-9	The institute to carry out a comprehensive curricula revision of the existing programs. The curricula should be brought before the Senate in the next meeting.	The curriculum revision workshop was held on 8th December 2017. The detailed report is enclosed as Annexure-IV. Implementation in process.
Senate NOTED the action taken.		
ITEM SEN:2-12	The evaluation policy for the courses should be approved by the Director and communicated to the students at the beginning of the semester.	Implemented.
Senate NOTED the action taken.		
ITEM SEN:2-15.2	Senate recommended that an Internal Committee consisting of student's representatives, PIC Student Affairs and the Wardens should go through the Discipline Manual together and discuss the same before adopting the manual.	The Hostel executive Committee (HEC) and the student's representatives met on 23rd Feb 2018 on above issue. During the meeting a few changes were proposed, which were accepted by the Director. The suggested changes are placed at **Annexure-I.** The discipline manual has been suitably modified including the suggested changes.
Senate Recommendations: 1. the student discipline manual be adopted in its present form. 2. For general awareness of internet usage, a disclaimer to be put up while login to CYBEROAM account. 3. Institute ICT equipment and services usage policy to be included in the UG Student Manual 4. Conduct a session on Cyber Crimes and Laws at the beginning of every academic year, for all students. The session could be included in the orientation program. Following the orientation, undertaking from students be taken for usage of IT equipment and services provided by the institute.		
ITEM SEN:2-15.3	Conduct of Supplementary exams	Implemented. Exam held in last week of Jan 2018 and results processed.
Senate NOTED the action taken.		

SEN:3-3 TO CONFIRM THE RESULTS OF B.TECH. (CSE AND IT) FOR AUTUMN SEMESTERS 2017-18

The results of B.Tech. CSE and IT for Autumn Semesters 2017-18 are placed at **Annexure-II.** Summary of the results is as under:

(A) Batch wise summary of student performance

The details are as under:

(i) B.Tech in Computer Science and Engineering

Student Batch	2014-15	2015-16	2016-17	2017-18
Max CPI	9.73	9.21	9.67	10
Avg CPI	6.98	7.26	7.36	6.55
Max SPI	9.8	8.77	9.18	10
Avg SPI	6.57	7.31	6.89	6.55

(ii) B.Tech in Information Technology

Student Batch	2014-15	2015-16	2016-17	2017-18
Max CPI	8.91	8.44	8.15	9.21
Avg CPI	7.06	6.90	6.58	6.33
Max SPI	8.29	8.52	8.38	9.21
Avg SPI	6.69	7.69	6.34	6.33

SEN:3-4 TO APPROVE THE ACADEMIC ACTIVITIES PLANNED FOR WINTER SEMESTER 2017-18

Decision: *The senate noted and ratified the Academic calendar 2017-18 placed in* ***Annexure-III****.*

SEN:3-5 TO APPROVE THE UG CURRICULUM REVISION OF CSE/ IT PROGRAMME AND DEVELOPMENT OF PROPOSED B.TECH. ECE PROGRAMME.

As per the directions of the Senate, the Institute carried out activities to revise the curriculum of CSE/IT programme and develop new curricula for proposed ECE programme. The detailed curricula is placed as **Annexure-IV**. The main features are highlighted below:

(a) The total credits are proposed to be limited between 160 to 180.
(b) All laboratory components are separated as a course.
(c) The laboratory courses are limited to 2-3 hours only as against 2-4 hours.
(d) It is proposed to keep the first year courses of all branches common.
(e) Credit distribution under different course categories is tabulated below:

A) Summary of Credit Distribution:

Distribution of Credits: UG Curriculum				
		Existing		Proposed
Ser No	Course Categories	CSE	IT	CSE / IT / ECE
1	Mathematics & Statistics	15	16	12
2	Natural Science (Physics, Chemistry, Biology)	14	14	12
3	Humanities, Social Science, Literature, Management & Soft-skills (including Electives)	16	16	12
5	Core Engineering Courses (from the branch of study)	62	61	60
6	Core Engineering Courses (from the other branch of Engineering)	14	10	12
7	Program Elective (from the branch of study)	17	23	20
8	Elective (from other branch of Engineering)	8	8	6
9	Open Elective (Science / Humanities / Engineering: not more than one from each)	6	6	6
10	Projects, Internships (Research/Industrial)	24	24	24
	Total Credits	**176**	**178**	**164**

			Existing	Proposed
	Credit convention	**Credits**	**Hours**	**Hours**
	Lecture	1	1	1
	Tutorial	1	1	1
	Practicals	1	2	2
	Practicals	2	4	3

Decision: *The senate NOTED and APPROVED the proposed first year curriculum of B.Tech. in CSE/ IT/ ECE. The senate recommends that the detailed curricula for the programs be presented in the next senate meeting for review and approval. The new curricula will be adopted from academic year 2018-19.*

The senate also recommended that the UG Academic Manual should include a chapter on the program objectives, course outcomes, mapping to the graduate attributes and linkages with the institute mission and vision statements.

SEN:3-6 TO APPROVE THE POLICY ON AWARD OF GRADES IN COURSES FOR STUDENTS ABSENT DURING EXAMINATIONS.

Decision: *The senate NOTED and APPROVED the policy for evaluation and award of grades in courses in case of absence during the examinations which is placed at* ***Annexure-V.***

SEN:3-7 TO APPROVE THE PROPOSAL FOR REMOVAL OF THEORY EXAMS FOR COURSES WITH L-T-P-C: 1-0-X-X OR 0-1-X-X

Decision: *The senate APPROVED the proposal for abolition of theory exams for courses with credit structure L-T-P-C : 1-0-X-X or 0-1-X-X. These courses will be treated as pure laboratory courses.*

SEN:3-8 TO CONSIDER AND APPROVE THE PANEL OF EXPERTS FOR FACULTY AND OFFICER SELECTION

As per statues of the IIITs circulated by MHRD, the selection committees of Professors, Associate Professors, Assistant Professors and Officers, one expert is to be nominated by the Senate.
The proposed lists of the experts for faculty and officer selections are placed at **Annexure-VI** and **Annexure-VII** respectively.

Decision: *The Senate approved the panel of experts and recommended to include more experts from the industry in the list. The senate also pointed out that such a panel should grow with time by including more experts.*

SEN:3-9 PROPOSAL ON INCREASE IN ADMISSION TO M.TECH. IN COMPUTER SCIENCE AND ENGINEERING FROM 20 TO 30.

For the Academic Year 2017-18 the number of the seats for the M.Tech (Computer Science & Engineering) was 20. However, only 6 students took admission.

In order to have optimum strength to run the program and also to fulfil the requirement of teaching assistants, it is proposed to increase the number of seats from 20 to 30.

Decision: *The Senate NOTED and APPROVED the proposal.*

SEN:3-10 PROPOSAL ON JOINING CENTRAL COUNSELLING CUM ADMISSION PROCEDURE FOR M.TECH. THROUGH CCMT

The institute has approached MHRD with a request to join the Centralized Counselling for M.Tech. (CCMT) for admissions to M.Tech. in CSE program. The same has been accepted and all formalities have been completed. The seat matrix for M.Tech admission to Academic Year 2018-19 through CCMT is as under:

Programme/ Specialization	**Open**	**Open (PwD)**	**SC**	**SC (PwD)**	**ST**	**ST (PwD)**	**OBC -NCL**	**OBC-NCL (PwD)**	**Total**
M.Tech in Computer Science and Engineering	14	1	4	1	2	0	8	0	30

Decision: *The Senate NOTED and APPROVED the proposal.*

SEN:3-11 PROPOSAL ON ADMISSION OF INTERNATIONAL STUDENTS

It is proposed to include international students in admissions. The number of seats for international students (DASA, Study in India etc) shall be limited to 25% (over and above) of the sanctioned strength at present intake.

Decision: *The senate NOTED and APPROVED the proposal in principle.*

SEN:3-12 PROPOSAL ON JOINING CENTRAL ADMISSION SCHEME FOR FOREIGN STUDENTS - DASA (DIRECT ADMISSION FOR STUDENT ABROAD PROGRAM) AND STUDY IN INDIA CAMPAIGN

The institute was asked for willingness to join the Government of India mega campaign of "Study in India" under MHRD. The institute has given its willingness.

The institute has approached MHRD for joining **Direct Admission For Student Abroad Program – DASA**. MHRD has agreed in principle however, no formal letter has come. Fee structure will be as suggested by DASA.

The seats to be offered under the above mentioned schemes is proposed to be 10% each of the sanctioned seats (B.Tech – 140 and M.Tech 30). These seats would be over and above the sanctioned seats.

The details of the seats offered are as under:

Ser No	Programme	Sanctioned Seats	Seats Offered for "Study in India" under MHRD	DASA	Total Inclusive of All
1	B.Tech	140	14	14	140+35 = 175
2	M.Tech	30	3	3	30+7=37
3	PhD	2 per faculty	Nil	Nil	2 per faculty

Decision: *The senate APPROVED the seat allocation for international students.*

SEN:3-13 TO CONSIDER AND APPROVE THE UG SEAT MATRIX FOR ACADEMIC YEAR 2018-19

The institute operation is becoming independent and diverse and there is a need for expansion in UG programmes. Hence, it is proposed to increase the UG student intake to 200. The institute has adequate infrastructure to accommodate increased intake.

As per the mandate of the institute, the institute being in PPP mode, the institute will not receive grants for recurring expenses from next academic year onwards. At present the predominant source of Internal Resource Generation (IRG) is student fees. It is also proposed to include international student's seats in admissions from year 2018-19 onwards.

In view of the above, the following seat matrix is proposed for academic year 2018-19.

UG Program	Year 2017-18	Year 2018-19 (Considered in SEN2-9)	Year 2018-19 (Proposed)	International Students (upto 25%)	Total Students (Year 2018-19)

B.Tech. in CSE	80	80	120	30	150
B.Tech. in IT	60	40	40	10	50
B.Tech. in ECE	0	40	40	10	50
Total Students	140	160	200	50	250

Decision: The senate NOTED and APPROVED the proposed seat matrix for academic year 2018-19.

SEN:3-14 ANY OTHER ITEM WITH THE PERMISSION OF THE CHAIR

1. Proposal to revise the laboratory duration for courses with 4 hour laboratories to 3 hours for 2015-16, 2016-17 and 2018-19 batch students from academic year 2018-19 onwards.

   Decision: *The senate approved the proposal.*

2. A proposal for institutional support to students for academic research/ outreach and other non-academic activities is placed in **Annexure-VIII**.

   Decision: *The senate appreciated the initiative and APPROVED the proposal.*

3. To consider the recommendations of the committee constituted by the director to analyze the admissions in B.Tech. in ECE program in terms of number of seats offered at various centrally funded technical institutes and government engineering colleges in Gujarat. The committee report along with recommendations is placed in **Annexure-IX**.

   Decision: *The senate considered the report and data submitted by the committee. The senate NOTED and* ***re-affirmed*** *the recommendation (SEN:2-9) to begin with B.Tech. in Electronics and Communication from academic year 2018-19. Expansion of UG program by introducing a B.Tech. in ECE program is in synchronization with the IIIT mandate and a natural step towards expanding the scope of the institute in terms of academics, research and institute finance.*

The senate accepted the committee recommendations.

4. The director informed the senate about the first convocation of the institute being planned in the last week of January 2019.

   Decision: *The senate suggested to be careful in selecting dates for holding convocation in the month of January due to Vibrant Gujarat summit. The senate also authorized the director to discuss with the stakeholders and plan the same.*

Annexure-1

Summary of Changes in Disciplinary Manual

S.No.	Item	Discussion	Suggested Changes
1.	Section-III, Item 14: Keeping of Motorized vehicles	3rd and 4th year students preparing for various examinations (competitive) and need to attend coaching classes may be allowed to keep the motorized vehicle.	Special permission (case to case) will be granted. If a student is permitted with special consideration, the vehicle must not be shared.
2.	Section-V: List of possible deterrents. P-24: Outright expulsion from the Institute.	The deterrent should include academic as well as hostel indiscipline.	Outright expulsion from the Institute and/or Hostel. (for a time period to be decided based on severity of the indiscipline)
3.	Section VI: Typical Offences to be considered by DAC	OA-13: Stealing private or public property.	Deterrent added: P-3: Debarment from elected offices and captaincy of sports teams.
		OA-17: Forgery, impersonation and other ways of using the identity of another student.	Deterrent Added: P-24: Outright expulsion from the Institute and/or Hostel. (for a time period to be decided based on severity of the indiscipline)
		OA-21: Systematically harassing another student.	
		OA-22: Harassing female students through verbal abuse or written abuse.	
		OA-39: Harassing female students through photographic, print or electronic media.	

Annexure-2

Summary of performance of B.Tech 2014-15 batch students is placed below:

	Highest CPI	Average CPI	Lowest CPI
CSE	9.73	6.98	4.91
IT	8.91	7.06	5.07

Number of Students	CPI>9	CPI : 8-9	CPI: 7-8	CPI <7
CSE (69)	03	12	19	35
IT (51)	00	09	19	23

Summary of performance of B.Tech 2015-16 batch students is placed below:

	Highest CPI	Average CPI	Lowest CPI
CSE	9.21	7.26	5.08
IT	8.44	6.90	4.92

Number of Students	CPI>9	CPI : 8-9	CPI: 7-8	CPI <7
CSE (63)	01	15	23	24
IT (30)	00	03	12	15

Summary of performance of B.Tech 2016-17 batch students is placed below:

	Highest CPI	Average CPI	Lowest CPI
CSE	9.67	7.36	4.38
IT	8.15	6.58	4.97

Number of Students	CPI>9	CPI : 8-9	CPI: 7-8	CPI <7
CSE (61)	08	16	15	22
IT (20)	00	02	05	13

Summary of performance of B.Tech 2017-18 batch students is placed below:

	Highest CPI	Average CPI	Lowest CPI
CSE	10	6.55	0.00
IT	9.21	6.33	0.95

Number of Students	CPI>9	CPI : 8-9	CPI: 7-8	CPI <7
CSE (60)	03	09	15	33
IT (40)	01	06	06	27

(A) Batch wise Summary of student performance

B.Tech in Computer Science and Engineering

	2014-15	2015-16	2016-17	2017-18
Max CPI	9.73	9.21	9.67	10
Avg CPI	6.98	7.26	7.36	6.55
Max SPI	9.8	8.77	9.18	10
Avg SPI	6.57	7.31	6.89	6.55

B.Tech in Information Technology

	2014-15	2015-16	2016-17	2017-18
Max CPI	8.91	8.44	8.15	9.21
Avg CPI	7.06	6.90	6.58	6.33
Max SPI	8.29	8.52	8.38	9.21
Avg SPI	6.69	7.69	6.34	6.33

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Indian Institute of Information Technology Vadodara
Bldg No. 9, IIITV, Government Engineering College, Sector 28,
Gandhinagar, Gujarat, India - Contact No. 079- 29750281

Institute Calendar

Winter Semester (Academic Year 2017-18)

Sr. No.	Event	Date(s)	Day(s)
1	Pre-registration	3 October, 2017	Tuesday
2	Commencement of Classes	1 January, 2018	Monday
3	Registration for Returning Students (After Noons)	1 - 3 January, 2018	Monday to Wednesday
4	Registration for PhD Students	1st week January, 2018	
5	PhD Orientation Program	1st week January, 2018	
6	TA Orientation Program	4 January, 2018	Thursday
7	Last date of submission of consent form for B.Tech. Projects	5 January, 2018	Friday
8	Last date of Add-Drop Course	5 January, 2018	Friday
9	Technical Workshop / Literature Club Event	1st week January, 2018	
10	Nabhyan / Sports Competition	2nd week January, 2018	
11	Last date of late registration with fine	15 January, 2018	Monday
12	Supplementary Exams	15-19 January, 2018	Monday to Friday
13	Online Coding Competition - I	3rd week January, 2018	
14	Conversion of `I' Grades	22 January, 2018	Monday
15	Republic Day / Ventura / Ek Bharat Shrestha Bharat	26 January, 2018	
16	Design Club Event	2nd week February, 2018	
17	Matrabhasha Diwas / Revive	21st Februay, 2018	Wednesday
18	Tech-Fest	9-10 March, 2018 (Friday-Saturday)	
19	In-Semester Examination - I	15, 16, 19, 20 February, 2018	Thursday, Friday, Monday, Tuesday
20	Online Coding Competition - II	1st week March, 2018	
21	Web-Development Event	2nd week March, 2018	
22	In-Semester Examination - II	23, 26, 27, 28 March, 2018	Friday, Monday, Tuesday, Wednesday
23	Design-Club Presentation	1st week April, 2018	
24	Course Evaluation	16 - 20 April, 2018	Monday to Friday
25	Lab Examination	16 - 20 April, 2018	Monday to Friday
26	Make-up Period	23 - 25 April, 2018	Monday to Wednesday
27	Pre-registration for Autumn Semester	23 April, 2018	Monday

28	End-Semester Examination	26 April - 4 May, 2018	Thursday to Friday
29	Last date of Submission of B.Tech. Project report	27 April, 2018	Friday
30	B.Tech. Project Evaluation	3-4 May, 2018	Thursday, Friday
31	Last Date of Submission of Grades to Registrar's Office	11 May, 2018	Friday
32	Announcement of Results	21 May, 2018	Monday
33*	Summer Internship Permissable Period	3 May - 20 July, 2018	
34*	Summer Design Project Permissable Period	15 May - 15 July, 2018	

* Work to be carried out for specified period within this duration

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Proposed Curriculum

for

Bachelor of Technology

in

Computer Science and Engineering

Information Technology

Electronics Communication and Engineering

Indian Institute of Information Technology Vadodara

March 2018

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Chapter 1

B.Tech. Program: Course Structure and Credit Distribution

1.1. Introduction:

Education at the Institute is organized around the semester-based credit system of study. A student is allowed to attend classes in a course and earn credit for it, only if he/she has registered for that course. Prominent features of the credit system are a process of continuous evaluation of a student's performance/progress and flexibility to allow a student to progress at an optimum pace suited to his/her ability or convenience, subject to fulfilling minimum requirements for continuation and within maximum allowable period for completion of a degree. A student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, grade point is calculated. A minimum grade point is required to be maintained for satisfactory progress and continuation in the programme. Also a minimum number of earned credits and a minimum grade point should be acquired in order to qualify for the degree.

1.2. Definition of Credits:

1 hour Lecture (L) per week	1 Credit
1 hour Tutorial (T) per week	1 Credit
2 hours Laboratory (L) per week	1 Credit
3 hours Laboratory (L) per week	2 Credits

1.3. Range of Credits:

For a student to be eligible to get Bachelor of Technology degree, a range of credits earned should be in between 160-180.

1.4. Bachelor of Technology Program: Credit Distribution

Distribution of Credits				
		Existing		Proposed
Code	Course Categories	CSE	IT	CSE / IT / ECE
MS	Mathematics & Statistics	15	16	12
SC	Natural Science (Physics, Chemistry, Biology), Environmental Science	14	14	12
HS	Humanities, Social Science, Literature, Management & Soft-skills (including Electives)	16	16	12
PC	Core Engineering Courses (from the branch of study)	62	61	60
OC	Core Engineering Courses (from the other branch of Engineering)	14	10	12
PE	Program Elective (from the branch of study)	17	23	20
EO	Elective (from other branch of Engineering)	8	8	6
OE	Open Elective (Science / Humanities / Engineering: not more than one from each)	6	6	6
PI	Projects, Internships (Research/Industrial)	24	24	24
	Total Credits	**176**	**178**	**164***

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

1.5. Credit distribution in the First Year of Bachelor of Technology Program:

Code	Course Categories	Credits
MS	Mathematics & Statistics	8
SC	Basic Sciences (Physics, Chemistry, Biology), Environmental Science.	10
HS	Humanities, Social Science, Literature, Management, Soft-skills	6
PC	Core Engineering Courses (from the branch of study)	6
OC	Core Engineering Courses (from the other branches of Engineering)	16
PE	Program Electives (from the branch of study)	0
EO	Electives (from other branches of Engineering)	0

OE	Open Electives (Science / Humanities / Engineering: Not more than one from each)	0
PI	Projects, Internships (Research/Industrial)	0
	Total Credits	**46**

1.6. Overall Credit distribution of the Bachelor of Technology Program:

A. Computer Science and Engineering

	Cr.	I				II				III				IV				V				VI				VII				VIII			
		L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C
MS	**14**	3	1	0	**4**	3	1	0	**4**	3	1	0	**4**	0	1	2	**2**																
					4				**4**				**4**				**2**				**0**				**0**				**0**				**0**
SC	**12**	3	1	2	**5**	3	1	2	**5**	2	0	0	**2**																				
					5				**5**				**2**				**0**				**0**				**0**				**0**				**0**
HS	**12**	2	0	2	**3**	3	0	0	**3**	1	1	2	**3**	3	0	0	**3**																
					3				**3**				**3**				**3**				**0**				**0**				**0**				**0**
PC	**61**					3	1	2	**5**	3	0	3	**5**	3	0	3	**5**	3	0	2	**4**	3	0	2	**4**	3	0	2	**4**				
										3	0	2	**4**	3	0	3	**5**	3	0	3	**5**	3	0	2	**4**								
										3	0	3	**5**	3	0	2	**4**	3	0	2	**4**												
														3	0	0	**3**																
					0				**5**				**14**				**17**				**13**				**8**				**4**				**0**
PE	**20**																	3	0	2	**4**	3	0	2	**4**	3	0	0	**3**				
																		3	0	0	**3**	0	1	2	**2**	3	0	2	**4**				
					0				**0**				**0**				**0**				**7**				**6**				**7**				**0**
OC	**17**	3	0	3	**5**	3	1	3	**6**																								
		3	1	3	**6**																												
					11				**6**				**0**				**0**				**0**				**0**				**0**				**0**
EO	**6**																					3	0	0	**3**	3	0	0	**3**				
					0				**0**				**0**				**0**				**0**				**3**				**3**				**0**
OE	**6**																					3	0	0	**3**	3	0	0	**3**				
					0				**0**				**0**				**0**				**0**				**3**				**3**				**0**
PI	**24**																	0	0	0	3					0	0	0	3	0	0	36	**18**
					0				**0**				**0**				**0**				**3**								**3**				**18**
	172																																
Tot.	**172**	**14**	**3**	**10**	**23**	**15**	**4**	**7**	**23**	**15**	**2**	**10**	**23**	**15**	**1**	**10**	**22**	**15**	**0**	**9**	**23**	**15**	**1**	**8**	**20**	**15**	**0**	**4**	**20**	**0**	**0**	**36**	**18**
Contact hrs. per week		**27**				**26**				**27**				**26**				**24**				**24**				**19**				**36**			

B. Information Technology

	Cr.	I				II				III				IV				V				VI				VII				VIII			
		L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C
MS	**12**	3	1	0	**4**	3	1	0	**4**	3	1	0	**4**																				
					4				**4**				**4**				**0**				**0**				**0**				**0**				**0**
SC	**12**	3	1	2	**5**	3	1	2	**5**	2	0	0	**2**																				
					5				**5**				**2**				**0**				**0**				**0**				**0**				**0**
HS	**12**	2	0	2	**3**	3	0	0	**3**	1	1	2	**3**	3	0	0	**3**																
					3				**3**				**3**				**3**				**0**				**0**				**0**				**0**
PC	**62**	3	0	3	**5**					3	0	3	**5**	3	0	3	**5**	3	0	3	**5**	3	0	2	**4**	3	0	2	**4**				
										3	0	2	**4**	3	0	3	**5**	3	0	2	**4**	3	0	2	**4**								
										3	0	3	**5**	3	0	2	**4**	3	0	2	**4**												
														3	0	2	**4**																
					5				**0**				**14**				**18**				**13**				**8**				**4**				**0**
PE	**20**																	3	0	2	**4**	3	0	2	**4**	3	0	0	**3**				
																		3	0	0	**3**	0	1	2	**2**	3	0	2	**4**				
					0				**0**				**0**				**0**				**7**				**6**				**7**				**0**
OC	**17**	3	1	3	**6**	3	1	3	**6**																								
						3	1	2	**5**																								
					6				**11**				**0**				**0**				**0**				**0**				**0**				**0**
EO	**6**																					3	0	0	**3**	3	0	0	**3**				
					0				**0**				**0**				**0**				**0**				**3**				**3**				**0**
OE	**6**																					3	0	0	**3**	3	0	0	**3**				
					0				**0**				**0**				**0**				**0**				**3**				**3**				**0**
PI	**24**																	0	0	0	3					0	0	0	3	0	0	36	**18**
					0				**0**				**0**				**0**				**3**								**3**				**18**
	171																																
Tot.	**171**	**14**	**3**	**10**	**23**	**15**	**4**	**7**	**23**	**15**	**2**	**10**	**23**	**15**	**0**	**10**	**21**	**15**	**0**	**9**	**23**	**15**	**1**	**8**	**20**	**15**	**0**	**4**	**20**	**0**	**0**	**36**	**18**
Contact hrs. per week		**27**				**26**				**27**				**25**				**24**				**24**				**19**				**36**			

C. Electronics and Communication Engineering

	Cr.	I				II				III				IV				V				VI				VII				VIII			
		L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C
MS	**16**	3	1	0	**4**	3	1	0	**4**	3	1	0	**4**	0	1	2	**2**																
					4				**4**				**4**				**2**				**0**				**0**				**0**				**0**

SC	**15**	3	1	2	**5**	3	1	2	**5**	2	0	0	**2**					3	0	0	**3**														
					5				**5**				**2**				**0**				**3**				**0**				**0**						**0**
HS	**12**	2	0	2	**3**	3	0	0	**3**	1	1	2	**3**	3	0	0	**3**																		
					3				**3**				**3**				**3**				**0**				**0**				**0**						**0**
PC	**60**	3	1	3	**6**					3	0	0	**3**	3	1	0	**4**	3	0	2	**4**	3	1	0	**4**										
										3	1	0	**4**	3	1	0	**4**	3	0	0	**3**	0	1	3	**3**										
										3	1	0	**4**	3	1	0	**4**	0	1	3	**3**	3	0	2	**4**										
										0	0	3	**2**	0	0	3	**2**	3	0	2	**4**														
														0	0	3	**2**																		
					6				**0**				**13**				**16**				**14**				**11**				**0**						**0**
PE	**20**																	3	1	0	**4**	3	0	2	**4**	3	0	0	**3**						
																										3	0	0	**3**						
																										3	0	0	**3**						
																										0	1	3	**3**						
					0				**0**				**0**				**0**				**4**				**4**				**12**						**0**
OC	**16**	3	0	3	**5**	3	1	2	**5**																										
						3	1	3	**6**																										
					5				**11**				**0**				**0**				**0**				**0**				**0**						**0**
EO	**6**																					3	0	0	**3**	3	0	0	**3**						
					0				**0**				**0**				**0**				**0**				**3**				**3**						**0**
OE	**6**																					3	0	0	**3**	3	0	0	**3**						
					0				**0**				**0**				**0**				**0**				**3**				**3**						**0**
PI	**24**																	0	0	0	3					0	0	0	3	0	0	36	**18**		
					0				**0**				**0**				**0**				**3**								**3**						**18**
	175																																		
Tot.	**175**	**14**	**3**	**10**	**23**	**15**	**4**	**7**	**23**	**15**	**4**	**5**	**22**	**15**	**3**	**8**	**23**	**15**	**2**	**7**	**24**	**15**	**2**	**7**	**21**	**15**	**1**	**3**	**21**	**0**	**0**	**36**	**18**		
Contact hrs. per week					**27**				**26**				**24**				**26**				**24**				**24**				**19**						**36**

1.7. Course Code:

Course Code: AB XYZ				
AB		**X**	**Y**	**Z**
Subject Code		**Year of the Programme**	**Course Type**	**Semester**
Computer Science	CS	B.Tech.: 1 / 2 / 3 / 4	Theory Course: 1 / 2 / 3 / 4 / 5 / 6	Autumn: Odd (1 / 3 / 5 / 7)
Information Technology	IT	M.Tech. / Ph.D.: 6 / 7	Laboratory Course: 7 / 8	Winter: Even (2 / 4 / 6 / 8)
Mathematics	MA		Seminar / Project / Internship: 9	

Physics	PH	
Electronics	EL	
Electrical	EE	
Science	SC	
Humanities & Social Science	HS	

Chapter 2

Detailed 1st Year Curriculum Contents (Common to all branches of studies)

2.1. Course Structure:

Semester	Course Code	Course	L	T	P	C	Course Category
Sem. - I	**MA111**	Mathematics-I (Linear Algebra and Matrices)	3	1	0	4	MS
	PH110 / PH120	Mechanics and Thermodynamics / Waves and Electromagnetics	3	1	0	4	SC
	PH170 / PH180	Mechanics and Thermodynamics Laboratory / Waves and Electromagnetics Laboratory	0	0	2	1	SC
	IT111	Computer Programming and Problem Solving	3	0	0	3	OC
	IT171	Computer Programming and Problem Solving Laboratory	0	0	3	2	OC
	EL110 / EE 110	Basic Electronic Circuits / Basic Electrical Engineering	3	1	0	4	PC
	EL170 / EE170	Basic Electronic Circuits Laboratory / Basic Electrical Engineering Laboratory	0	0	3	2	PC
	HS111	Spoken and Written Communication	2	0	2	3	HS
	Semester - I : Total		**14**	**3**	**10**	**23**	
Sem. - II	**MA112 / MA114**	Mathematics-II (Calculus / Discrete Mathematics)	3	1	0	4	MS
	PH120 / PH110	Waves and Electromagnetics / Mechanics and Thermodynamics	3	1	0	4	SC
	PH180 / PH170	Waves and Electromagnetics Laboratory / Mechanics and Thermodynamics Laboratory	0	0	2	1	SC
	EE110 / EL110	Basic Electrical Engineering / Basic Electronic Circuits	3	1	0	4	OC
	EE170 / EL170	Basic Electrical Engineering Laboratory / Basic Electronic Circuits Laboratory	0	0	3	2	OC
	CS112	Introduction to Data Structures	3	0	0	3	OC

	CS172	Introduction to Data Structures Laboratory	0	1	2	2	OC
	HS112	Science Technology and Society	3	0	0	3	HS
	Semester - II : Total		**15**	**4**	**7**	**23**	
Year - I : Total			**29**	**7**	**17**	**46**	

2.2. Course Contents:

2.2.1. MA 111: Linear Algebra and Matrices (3-1-0:4)

Course Description: This core course aims at introducing students to the fundamental concepts of linear algebra culminating in abstract vector spaces and linear transformations. The course starts with systems of linear equations, matrices, matrix algebra, eigenvalues and eigenvectors. The course then goes on to introduce some basic concepts of the theory of vector spaces in the concrete setting of real n dimensional vector space and linear transformations. At the end, numerical methods are introduced to apply the theory to real life problems. The subject material is of vital importance in all fields of mathematics and sciences in general.

Course objective: Students will be able to apply the concepts and methods described in the syllabus and solve problems using linear algebra.

Course Contents:

Unit 1: Matrices and Linear systems **[1 hrs.]**

Matrix operations(addition, multiplication), Block-Partitioned Matrices and Block Operations, Elementary Row and Column Operations, Determinant of a Square Matrix, Properties of the Determinant Function , Cofactor Expansion, Rank of a Matrix, The System of Linear Equations: Ax=b

Unit 2: Canonical Factorizations: **[1 hrs.]**

Eigenvalues and Eigenvectors, Companion Matrices and Characteristic Polynomial, Method of Danilevsky for Characteristic Polynomial, diagonalization-Matrices with

a Full-Set of Eigenvectors, The Cayley-Hamilton Theorem, Triangulization and Unitary Diagonalization of a Matrix, Schur's Lemma and the Spectral Theorem, QR-Decomposition, QR-Algorithm for Hessenberg Matrices, Singular Value Decomposition

Unit 3: Vector Spaces **[1 hrs.]**

Vector Space over the set real numbers (Field), Linear Independence of Vectors, Bases in a Vector Space, Dimension of a Vector Space, Direct Sum Decomposition of a Vector Space, Linear Transformations, Change of Bases, Canonical forms, Rank of a Linear Transformation

Unit 4: Numerical methods **[1 hrs.]**

Iterative methods (Jacobi, Gauss-Seidel, Relaxation) for solving linear systems, computing of eigenvalues and eigenvectors.

Text Book:

1. *Introduction to Linear Algebra*, Gilbert Strang, 5th Ed, SIAM, 2016.

References:

1. *Linear Algebra*, Kunze Ray, Hoffman Kenneth 2nd Ed, Phi Learning, 2014.
2. *Fundamentals of Matrix Computations*, David S. Watkins, 3rd ed, Wiley.

2.2.2. PH110: Mechanics and Thermodynamics (3-1-0:4)

Course Description: This course provides engineering students with important foundational knowledge about mechanics, and thermodynamics and its application to common engineering systems. The course also includes weekly small-group problem-solving tutorial session.

Course Learning Outcomes: On successful completion of this course, students should be able to:

1. demonstrate knowledge of the physical principles that describe mechanics, materials, heat transfer, and thermodynamics;
2. apply physical principles to common physical systems;
3. use the methods of algebra, vectors and calculus to make quantitative and qualitative predictions about the behavior of physical systems and
4. associate the correct unit with every physical quantity they use.

Course Contents:

Unit-I: Mechanics **[30 hrs.]**

Review of Newtonian Mechanics- Vectors and their time derivatives, Inertial and non-inertial frames of reference, Centrifugal and Coriolis forces; Work-Energy Theorem; Conservation Principles, Collision problem in laboratory and centre of mass frame, Motion under Central Force and its universal features, Oscillatory Motion-Free, Damped and Driven.

Introduction to Quantum Mechanics- Double-slit experiment, de Broglie's hypothesis. Uncertainty Principle, Wave-Function and Wave-Packets, Phase- and Group-velocities. Schrödinger Equation. Probabilities and Normalization. Expectation values. Eigenvalues and Eigenfunctions. Applications of Schrödinger Equation: Particle in a box, Finite Potential well, Harmonic oscillator, Hydrogen Atom problem.

Unit-II: Thermodynamics **[12 hrs.]**

Temperature and Zeroth Law of Thermodynamics, Work, Heat and First Law of Thermodynamics, Ideal Gas and Heat Capacities, Second Law of Thermodynamics, Carnot Cycle, Entropy, Thermodynamic variables and energies.

Text Books:

1. *An Introduction to Mechanics*; D. Kleppner and R. Kolenkow, Second Edition.
2. *Concepts of Modern Physics*; A. Beiser, Sixth Edition.
3. *Heat and Thermodynamics*; M. W. Zemansky and R. H. Dittman, Seventh Edition.

2.2.3. PH170: Mechanics and Thermodynamics Laboratory (0-0-2:1)

List of Experiments:

S.No.	Experimental Set-up	Key Topics
1.	Study of Motion on Linear Air-Track (Virtually Frictionless Surface)	Constrained linear motion, Newton's Laws, Elastic and Inelastic Collision, Conservation of Momentum and Energy.
2.	Centripetal Force and Moment of Inertia	Centripetal force, Moment of Inertia, Restoring Force, Axis of Rotation, Centre of Gravity, Linear and angular speed.
3.	Study of damped oscillation with spring-mass system	Oscillatory motion, Damped oscillation.
4.	Coupled Pendulum Oscillation	Oscillation with coupled pendulum, Phase difference, Beat, Coupling parameters,
5.	Study of photoelectric effect and determination of Planck's constant.	Particle nature of Light, Photons, Energy Quantization.
6.	Franck Hertz Experiment	Excitation Energy, Electron collision, Energy Levels, Ionization Energy.
7.	Balmer Series and determination of Rydberg constant	Bohr Atomic Model, Visible Spectrum, Energy Levels, Diffraction, Rydberg constant.

8.	Heat capacity of gases	Equation of state for ideal gases, First law of thermodynamics, Degree of freedom, Mole volumes, Isobars, Isotherms, Isochors and adiabatic changes of state.
9.	Specific Heat of Solids	Heat, Specific Heat Capacity, Conservation of Energy, Calorification.
10.	Mechanical Equivalent of Heat	Mechanical equivalent of heat, Mechanical work, Thermal energy, Thermal capacity, First law of thermodynamics, Specific thermal capacity.

2.2.4. PH120: Waves and Electromagnetics (3-1-0:4)

Course Description: The objective of this course is to give an idea how the electromagnetic wave behaves. This also provides an understanding of theories of electrostatics, magnetism and electrodynamics with their applications. The course also includes weekly small-group problem-solving tutorial session.

Course Learning Outcomes: The course will enhance the problem solving capacity of the student.

Course Contents:

Unit 1: Mathematical Foundations **[6 hrs.]**

Vector Calculus- Gradient, Divergence and Curl. Line, Surface and Volume integrals. Gauss's divergence theorem and Stokes' theorem in Cartesian, Spherical polar and cylindrical polar coordinates, Continuity equation.

Unit 2: Review of Electrostatics **[9 hrs.]**

Electrostatics in Vacuum-Discrete and Distributed Charges, Electrostatic Force, Scalar & Vector Potentials, Electrostatic Energy, Poisson and Laplace equation and its applications; Electrostatics in Dielectric Medium-Electric Polarization; Electric Displacement Vector, Dielectric Susceptibility, Energy in Dielectric Medium.

Unit 3: Review of Magnetostatics **[9 hrs.]**

Magnetic Fields and Forces, Biot-Savart law and Ampere's law, Magnetic Vector Potential, Magnetization-Diamagnetism, Paramagnetism and Ferromagnetism, Ampere's Law in Magnetized Materials-Auxiliary Field H, Magnetic permeability and susceptibility.

Unit 4: Review of Electrodynamics **[9 hrs.]**

Electromotive force, Time-varying fields, Faraday's' law of electromagnetic induction, Self and Mutual Inductance, Displacement Current, Maxwell's equations in Free Space & Inside Matter, Energy and Momentum in Electrodynamics.

Unit 5: Electromagnetic Waves **[9 hrs.]**

Wave equation, Propagation of Electromagnetic waves in Free Space and in Conducting Medium-Reflection and Refraction, Transmission and Dispersion.

Textbook:

Introduction to Electrodynamics, Griffiths. D. J, Prentice Hall, 2007.

References:

1. W. H. Hayt and J. A. Buck, *Engineering Electromagnetics*, Tata McGraw Hill Education Pvt. Ltd, 2006.
2. Purcell. E.M, *Electricity and Magnetism*, Berkley Physics Course, V2, Tata McGraw Hill, 2008.
3. Feynman. R.P, Leighton. R.B, Sands. M, *The Feynman Lectures on Physics*, Narosa Publishing House, Vol. II, 2008. Hill, 2008.
4. G. B. Arfken, H. J. Weber and F. E. Harris, *Mathematical Methods for Physicists*, Academic Press, 2013.

2.2.5. PH180: Waves and Electromagnetics Laboratory (0-0-2:1)

List of Experiments:

S.No.	Experimental Set-up	Key Topics
1.	Measurement of elementary charge using Millikan oil drop experiment.	Electric field, Viscosity, Stokes' law, Droplet method Electron charge.
2.	To study electric field lines and equipotential lines.	Electric Field Lines, Equipotential Lines, Surface Potential.
3.	Measurement of Dielectric constant of dielectric materials.	Capacitance, Dielectric Constant, Electric Field in Dielectric Medium, Electric Permittivity of a material.
4.	Magnetic field of paired coils in a Helmholtz arrangement with a Teslameter.	Maxwell's equations, Wire loop, Flat coils, Biot-Savart's law. Earth's magnetic field.
5.	Study of Faraday Law and Induced e.m.f.	Faraday and Lenz Laws, Induced e.m.f., Magnetic flux
6.	Study of Hysteresis in Ferromagnetic Materials.	Induction, Magnetic flux, Coil, Magnetic field strength, Magnetic field of coils, Remanence, Coercive field strength.
7.	Microwave optic system to study properties of electromagnetic waves.	Electromagnetic waves-Reflection, Refraction, Polarization, Interference, Diffraction, Transmission and Reception.
8.	Solar-Cell Trainer kit.	Particle nature of electromagnetic waves, Solar Energy, Electric Energy.

9.	Study of dispersion of light in Prism Spectrometer	Dispersion, Refraction, Refractive Index.
10.	Measurement of Permeability and Permittivity of Air and determination of speed of Light.	Permittivity and Permeability, Electrostatic force, Magnetic Force, Speed of Light.

2.2.6. IT111: Computer Programming and Problem Solving (3-0-0:3)

Course Objectives: To understand computer programming concepts and its roles in problem solving. To understand and develop well-structured programs.

Course contents:

Unit 1: Introduction to Computers

Computer Systems, Computing Environments.

Unit 2: Introduction to Programming

Programming methods, paradigms, problem solving techniques, algorithm development, flow charts, Editor, compiler, debugger, Software development.

Unit 3: Basics of Procedural Programming

Constants, variables, expressions, operators, assignment, basic input and output, built-in functions, program debugging.

Unit 4: Variables and Operators

Basic data types, precedence and order of evaluation, pointers, memory allocation of variables.

Unit 5: Control Structures

Selection statements, iteration statements.

Unit 6: Functions and Program Structure

Return values, actual and formal parameters, parameter passing: call by value versus call by reference, external variables, scope rules, header files, and recursion.

Unit 7: Arrays

Character arrays, one and two dimensional arrays; pointer arrays, command-line arguments.

Unit 8: I/O

ASCII data files, file pointers, end-of-file.

Unit 9: Basic Data Structures

Structures, defining new types, enumerations, dynamic memory allocation, dynamic arrays, linked lists and other pointer-based structures.

Text Book:

1. *C How to Program*, 7th Ed, P Deitel and H Deitel, Prentice Hall of India, 2012.

Reference Books:

1. *C programming language*, 2nd Ed, Kernighan, Brian W. & Ritchie, Dennis M, New Delhi. Prentice Hall of India, 1998.
2. *A Book on C*, 4 th Ed, Kelley, A.L. and Pohl Ira, Pearson India, 2002.
3. *A Structured Programming Approach Using C*, 1st Ed.,Forouzan, Behrouz, Course Technology, 2012.
4. *Practical C Programming*, 3rd Ed, Oualline, Steve, Shroff Publishers, 2000.
5. *C programming: The essentials for engineering and scientists*, Brooks, David R. New York. Springer, 1999.
6. *Programming In ANSI C* by E Balagurusamy.

2.2.7. IT171: Computer Programming and Problem Solving Laboratory (0-0-3:2)

Course Objective:

The purpose of this course is to enhance their analyzing and problem solving skills and use implements a list of programs in C or Python programming language. A possible list of programs are as follows.

Part A (two months):

1. Program to find area and circumference of circle

2. Program to convert temperature from degree centigrade to Fahrenheit.
3. Program to calculate sum of 5 subjects and find percentage.
4. Program to show swap of two no's without using third variable.
5. Program to reverse the digits of a given number.
6. Program to print a table of any number.
7. Program to find greatest in 3 numbers.
8. Program to find that entered year is leap year or not.
9. Program to shift input data by two bits to the left.
10. Program to display arithmetic operator using switch case.
11. Program to print stars Sequences (right triangular, Isosceles triangle, etc.).
12. Program to print Fibonacci series up to 100.
13. Program to find factorial of a number.
14. Program to find whether given no. is a prime no. or not.
15. Program to add two number using pointers.
16. Program to find the largest number in an array.
17. Program for removing the duplicate element in an array.
18. Program to add two matrices.
19. Program to multiply two matrices.
20. Program to find transpose of a matrix.
21. Program to swap two numbers using functions.
22. Program to show call by reference.
23. Program to find whether a string is palindrome or not.
24. Program to find occurrences of vowels, consonants, words, spaces and special characters in the given statement.
25. Program to create enumerated data type for 12 months. Display their values in integer constants.

26. Program for linear and binary search.
27. Program for bubble sort and insertion sort.
28. Program that would sort a list of names in alphabetical order.
29. Program to use (++,--) operator with return value of function.
30. Program to read characters from a text file and print number of vowels, consonants and other characters in the file. Assume that the file will consist of mostly English-language letters.

Part B (one and half months)

A small project is given in groups (at most 4 persons in each group). The objective is to apply knowledge of programming language primitives such as functions, structures and/or files in day today applications.

2.2.8. EL111: Basic Electronic Circuits (3-1-0:4)

Course Contents:

Unit 1: Introduction to Passive Circuit Elements & Sources **[2hrs]**

Resistor, Capacitor, Inductor, Voltage and Current sources, Controlled Sources, Thevenin and Norton Theorem.

Unit 2: Basics of Semiconductors **[2hrs]**

Semiconducting Materials, Intrinsic and Extrinsic Semiconductors, Charge-carrier Density and Distribution, Fermi level.

Unit 3: Diodes **[6hrs]**

p-n Diode, Zener Diode, *I-V* Characteristics, Diode Models, Rectifiers and Voltage Regulators, Clippers and Clampers, Introduction to Special Purpose Diodes: Varactor Diode, LEDs, Solar Cells, Photo-diodes, Tunnel Diode, Schottky Diode.

Unit 4: Bipolar Junction Transistors (BJTs) **[10hrs]**

BJT structure, Basic BJT operation mechanism, Input and Output characteristics of common-emitter configuration, Transistor Bias Circuits-Base Bias, Emitter Bias, Voltage-Divider Bias, Emitter Feedback Bias, Collector Feedback Bias, Emitter-

Collector Feedback Bias, ac Models, Voltage Amplifiers, Common Collector and Common Base Amplifiers, Power Amplifiers, and Frequency Response.

Unit 5: Field Effect Transistors **[8hrs]**

JFETs-Device structure, Drain Curves, Transconductance Curve, Biasing Circuits, JFET Amplifiers, MOSFETs-Device structure, Depletion-Mode MOSFET, D-MOSFET Curves, Amplifiers, Enhancement-Mode MOSFET, Digital Switching, CMOS, Power FETs.

Unit 6: Operational Amplifier **[8hrs]**

Differential Amplifiers, Op-Amp pin configuration, Ideal and Practical Characteristics of Op-Amp, Inverting and Non-Inverting Amplifiers, Active Filters, Summing Amplifier, Differential and Integrating Amplifiers, Comparators, Frequency response of an Op-Amp.

Unit 7: Oscillators **[6hrs]**

Amplifier with feedback, Condition of harmonic oscillation, Wein Bridge Oscillator, RC Oscillators, Colpitts Oscillators, 555 Timer and Circuits.

Text Books:

1. Electronic Principles, 7th Ed, Albert Malvino, and David Bates, Tata McGraw-Hill, 2007.
2. Electronic Devices; 9th Edition, Thomas L. Floyd, Pearson.
3. Op-Amps and Linear Integrated Circuits, Ramakant A. Gayakward, 4 Edition, Pearson.

2.2.9. EL170: Basic Electronic Circuits Laboratory (0-0-3:2)

The objective of the laboratory is to provide experimental hand-on experiences to the topics covering the course 'Basic Electronic Circuits'. The experiment modules are designed to give students the opportunity to construct circuits and verify theoretical relationships involving diodes, bipolar transistors, small-signal amplifiers and operational amplifiers. The students are expected to compare experimental results

with theoretical concepts, speculate reasons for discrepancies, and learn from deductive reasoning. In this lab, students become familiar with making basic electrical measurements using laboratory instruments such as digital multimeters (DMMs), power supplies, function generators and oscilloscopes. By the end of their lab coursework, students should be able to design, assemble, and use basic electronic circuits and have the skills necessary to measure and characterize their designs.

List of experiments:

1. Introduction to circuit elements and basic equipments: Resistors, Capacitors, Inductors, Diodes, Transistors, Oscilloscope, Function generator, Power supply, Cables and Switches.
2. Study of transient- and steady-state response of RC circuits and design RC Filters.
3. Study of current-voltage characteristics of a p-n junction and Zener diode at room temperature.
4. Design a regulated power supply using Zener diode.
5. Study of input and output current-voltage characteristics of *n-p-n* bipolar junction transistors in common-emitter configuration and determine transistor parameters.
6. Design a Common-Emitter Transistor (*n-p-n*) Amplifier Circuit, obtain the frequency response curve of the amplifier and determine the mid-frequency gain, *A*mid, lower and higher cut-off frequency of the amplifier circuit.
7. Design and study Inverting and Non-Inverting Operational Amplifiers.
8. Design two stage RC coupled common emitter transistor (*n-p-n*) amplifier circuit and to study its frequency response curve.
9. Design and study Integrator and Differentiator Operational Amplifier Circuits.
10. Design an Active Low pass Filter Circuit using Op-Amplifier.

References:

1. *Electronic Principles*, 7th Ed., Albert Malvino and David Bates, Tata McGraw-Hill, 2006.

2. *Laboratory Manual*, Basic Electronic Circuits Laboratory, IIIT Vadodara.

2.2.10. EE111: Basic Electrical Engineering (3-1-0:4)

Course Contents:

Unit 1: DC Circuits **[8 hrs.]**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

Unit 2: AC Circuits **[8 hrs.]**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

Unit 3: Transformers **[6 hrs.]**

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Unit 4: Electrical Machines **[8 hrs.]**

Single-phase induction motor: Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Construction and working of synchronous generators.

Unit 5: Power Systems **[6 hrs.]**

Power generation techniques, Transmission, Distribution, Grid, Cost of Electricity.

Unit 6: Power Converters **[6 hrs.]**

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

Text / Reference Books:

1. D. P. Kothari and I. J. Nagrath, "*Basic Electrical Engineering*", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "*Basic Electrical Engineering*", McGraw Hill, 2009.
3. L. S. Bobrow, "*Fundamentals of Electrical Engineering*", Oxford University Press, 2011.
4. E. Hughes, "*Electrical and Electronics Tec*hnology", Pearson, 2010.
5. V. D. Toro, "*Electrical Engineering Fundament*als", Prentice Hall India, 1989.

2.2.11. EE170: Basic Electrical Engineering Laboratory (0-0-3:2)

List of experiments/demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
4. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
6. Torque Speed Characteristic of separately excited dc motor.

7. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super synchronous speed.
8. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
9. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

2.2.12. HS: Spoken and Written Communication (2-0-2:3)

Course Contents:

Unit-I

Course instructor should make the students aware of the elements of communication, the role of English language for effective communication, the process of communication and factors that influence communication (sender, receiver, channel, code, topic, message, context, feedback, noise, filters & barriers), importance of audience and purpose, the information gap principle, verbal and non-verbal communication: body language, general communication and business communication. An ability to communicate well is a key soft skill. Many other skills depend on good communication skills. By learning the processes involved in communication, the students shall be able to appreciate the importance of good communication skills in becoming a successful professional.

Unit – II

Course instructor should introduce the students to the science of Articulatory Phonetics. It would be a basic training for mastering English sound system, particularly putting emphasis on British English, as well as basic knowledge on the Phonetics of English language. The focus shall be on IPA (International Phonetic Alphabet) symbols, the anatomy of speech organs, production and organization of

speech sounds and phonetic transcriptions. Understanding the phonetics of English shall help students in using dictionaries effectively and pronouncing words correctly.

Unit-III:

Course Instructor should make an optimal use of cinema for increasing the students' familiarity with English. Testing be done on the basis of the student's comprehension of the plot and their ability to describe scenes from the film. Classroom exercise of asking students to comment on the plot or scenes of a given film – not in writing but by standing before the entire class and speaking in English — be frequently carried out. The aim of this unit is to make the student feel confident about her/his ability to form sentence in English for discursive communication.

Unit-IV:

Course Instructor should use audio tapes, Ted Lectures, radio news broadcast or celebrated speeches, etc for exposing the students' to a real time' and good spoken English. Class room tests be set to check the students' ability to respond to their listening experience in writing. This will help the Course Instructor to continually assess the requirements of the students and provide corrective advise. Testing the writing skills of students will require setting several questions of very short composition tasks, from 50 words to 150 words. The topics chosen for the composition tasks should be selected from the topics covered in the classroom discussions or from the life on the campus.

Unit-V:

Students should be provided four to five extended samples of written English such as short stories or newspaper editorials for them to mark their difficulties – words, idioms, sentence structures, etc. This will help the students in improving their ability to do focused reading of serious written literature. Testing of the reading comprehension skills be tested by giving them in advance of the test several passages for reading. The Course Instructor may select one or more of those seen passages' for the examination purpose.

Text Books:

1. *Prism: Spoken and Written Communication*, Prose & Poetry published by Orient Longman, 2008.
2. *Technical Communication: Principles and Practice*, Second Edition by Meenakshi Raman and Sangeeta Sharma, Oxford Publications, 2009.

Books, Essays and Short Stories Recommended:

1. *English and Communication Skills for Students of Science and Engineering*. Dhanavel, S.P. Units 1-5, Chennai: Orient, .Blackswan Ltd., 2009.
2. *Scientific English: A Guide for Scientists and Other Professionals*. 2 nd ed. Day, R A., Hyderabad: Universities Press, 2000.
3. *A Course in Phonetics*, Fifth Edition, Ladefoged, Peter (Harcourt, Brace, Jovanovich: Fort Worth), 2006.
4. Of Ambition- Francis Bacon
5. Of Innovations- Francis Bacon
6. With the Photographer – Stephen Leacock
7. Speech on Indian Independence – Jawaharlal Nehru
8. Socrates and the Schoolmaster – F. L. Brayne
9. The Bet – Anton Chekov
10. An Astrologer‘s Day – R. K. Narayan
11. The Gift of the Magi – O’ Henry
12. The Monkey's Paw- W.W. Jacobs

2.2.13. MA112: Calculus (3-1-0:4)

Course Contents:

Unit 1: Fundamentals

Limits, continuity, differentiability, mean value theorems, and Taylor‘s theorem; fundamental theorem of integral calculus, definite integrals, trapezoidal and Simpson’s rule; sequences and series, tests for convergence: absolute and conditional convergence; power series and radius of convergence.

Unit 2: Functions of Several Variables

Partial derivatives, chain rule, gradient and directional derivative; Taylor's theorem for functions of several variables; maxima, minima and saddle points.

Unit 3: Vector Calculus

Gradient, divergence and curl. double, triple, line and surface integrals; theorems of Green, Gauss, Stokes and their applications.

Unit 4: Introduction to Complex Variables

Complex numbers and the complex plane, derivative and analytic functions.

Unit 5: Differential Equations

First order equations, second linear differential equations, partial differential equations basic concepts and important examples, Laplace and Fourier transforms.

Text Book:

1. *Calculus and Analytical Geometry*, 9th Ed, G B Thomas and R L Finney, Addison-Wesley, 1999.

Reference Book:

1. *Differential and Integral Calculus*, 3th Ed, Schaum's Outline Series, McGraw Hill, 1992.
2. *Advanced Engineering Mathematics*, 8th Ed, R. Kreyszig, John Wiley, 1999.

2.2.14. MA114: Discrete Mathematics (3-1-0:4)

Course Contents:

Unit 1: Foundation

Propositional and predicate logic, logical equivalences, predicates and quantifiers,

translation from language to logical expressions, nested quantifiers, set theory, set operations, set identities and functions, inverse and composition functions, graph of functions.

Unit 2: Number Theory

Division operator, prime factorization, properties of prime numbers, prime number theorem, GCD and LCM, modular arithmetic and applications, sequences and summations.

Unit 3: Counting

Permutation and combinations, pigeonhole principle, inclusion-exclusion principle, binomial theorem, Pascal identity and triangle.

Unit 3: Mathematical Reasoning and Induction

Rules of inference, direct proof, proof by contradiction, proof by contrapositive, mathematical induction and second law of mathematical induction.

Unit 5: Recursion

Definition, recursive algorithm, recurrence relations, solving recurrence relations.

Unit 6: Relations

Relations and their properties, applications and representations, equivalence relations, partial ordering, Hasse diagram.

Unit 7: Graphs

Introduction and terminology, representation, isomorphism, connectivity, Warshall's algorithm, Euler and Hamilton path, shortest path.

Text Book:

1. *Discrete Mathematics and its Application*, 7th Ed, K. Rosen, Tata McGraw Hill, **2011.**

Reference Book:

1. *Discrete Mathematical Structure*, 4th Ed, B. Kolman, R.C. Busby and S. C. Ross, PHI, 2000.
2. *Discrete Mathematics*, Richard Johnsonbaugh, Prentice Hall, 2007.
3. *Mathematics: A Discrete Introductio*n, 3rd Ed., Edward R. Scheinerman, Cengage Learning, 2006.

4. *Mathematical Structure for Computer Science*, 6th Ed, J. Gersting, Freeman, 2006.

2.2.15. CS112: Introduction to Data Structure (3-0-0:3)

Course Contents:

Unit 1: Introduction

Representation of data on a computer, data types & array and linked list representations ways of representing programs and associated data on computers

Unit 2: Analysis Tools

Notion of the running time of an algorithm, recurrences, parameters of performance.

Unit 3: Dictionary Operations

Find, max, min, successor, predecessor (query operations); insert, delete (modify operations) LIST DATA: Stacks, queues, variants implementation using arrays and linked lists.

Unit 4: Sorting

Comparison based sorting algorithms, other sorting algorithms, lower bounds for comparison-based sorting algorithms best-case, worst-case and average-case running times; quicksort, heap Sort, insertion sort, bubble sort etc.

Unit 5: Disjoint set data structure

Make-set, Union and Find Operations.

Unit 6: Trees

Heaps, Binary search trees (BST), heights of BST BALANCED BSTs: Red Black trees, AVL Trees, 2,3,4-trees, B Trees.

Unit 7: Graphs

Representation using adjacency matrices and adjacency lists, Graph searching algorithms BFS and DFS.

Text Book:

1. *Data Structures and Algorithms*, Aho, Hopcroft and Ullman, Addison-Wesley, 1999.

Reference Book:

1. Introduction to Algorithms, 3th Ed, Cormen, Lieserson and Rivest, PHI, 2011.

2.2.16. CS172: Introduction to Data Structure Laboratory (0-1-2:3)

Lab and take home assignments based on the course "Data Structures". Possible set of assignments may include the following list of experiments.

List of Experiments:

1. Design and Implement List data structure using i) array ii) singly linked list.
2. Design and Implement basic operations on doubly linked list.
3. Design and Implement stack using i) array ii) singly linked list.
4. Design and Implement Queue using i) array ii) singly linked list.
5. Design and Implement basic operations on Circular Queue.
6. Implementation of Searching algorithms (Linear search, Binary search).
7. Implementation of various sorting algorithms (Insertion sort, Bubble sort, Quick sort, Heap sort, Merge sort, counting sort, radix sort etc.).
8. Design and Implement basic operations (insertion, deletion, search, findmin and findmax) on Binary Search trees.
9. Design and Implement basic operations of various balanced BSTs, e.g., AVL tree, 2-3 Trees.
10. Implementation of Breadth First Search Techniques.
11. Implementation of Depth First Search Techniques.

2.2.17. HS112: Science Technology and Society (3-0-0:3)

Course Contents

Unit 1:

- Introduction to STS as a field of study and research in the twentieth century.
- Philosophical, Historical and Sociological Approaches to Science and Technology and Society.
- The growth and identity of Modern Science and Technology in India.

Unit 2: Science Communication- Institutions, ideologies, practices

- The diversity of science communication in colonial India.
- Science communication and the Nehruvian Agenda.
- The ideology and image of developmental science.
- The agenda of People's Science.
- Liberalization and the commoditization of science and technology.

Text Book:

1. *Science, Technology and Medicine in Colonial India* – David Arnold (Cambridge, 2004).
2. *Western Science in Modern India, Metropolitan Methods, Colonial Practices* – Pratik Chakrabarti, (Permanent Black, 2004).

Reference Book:

1. *A Concise History of Science in India* – D. M. Bose, S. N. Sen, and B.V. Subarayappa (Universities Press, 2009)

Chapter 3

B.Tech. in Computer Science and Engineering

3.1. Course Structure: The proposed course structure for B.Tech. in Computer Science and Engineering is tabulated below. The existing course structure, approved by the academic council in 2013, is provided in Appendix-A for reference.

Semester wise (III-VIII) Courses: B.Tech in Computer Science and Engineering						
Semester - III						**Course Category**
Course Code	**Course**	**L**	**T**	**P**	**C**	
	Environmental Science	3	0	0	3	SC
	Object Oriented Design & Programming	3	0	3	5	PC
	Digital Logic Design	3	0	2	4	PC
	Design and Analysis of Algorithms	3	0	3	5	PC
	Technical Writing	1	1	2	3	HM
	Probability and Statistics	3	1	0	4	MS
Total		**16**	**2**	**10**	**24**	

Semester - IV						
Course Code	**Course**	**L**	**T**	**P**	**C**	
	System Software	3	0	0	3	PC
	Database Management System	3	0	3	5	PC
	Operating Systems	3	0	3	5	PC
	Economics	3	0	0	3	HM
	Computer Organization and Architecture	3	0	2	4	PC
	Numerical Techniques	0	1	2	2	MS
Total		**15**	**1**	**10**	**22**	

Semester - V						
Course Code	**Course**	**L**	**T**	**P**	**C**	
	Computer Networks	3	0	2	4	PC
	Software Engineering	3	0	3	5	PC
	Formal Languages and Automata Theory	3	0	2	4	PC
	PE1	3	0	2	4	PE
	PE2	3	0	0	3	PE
	Design Project	0	0	0	3	PI

Total		**15**	**0**	**9**	**23**	

Semester - VI						
Course Code	**Course**	**L**	**T**	**P**	**C**	
	Artificial Intelligence	3	0	2	4	PC
	Introduction to Cryptography and Network Security	3	0	2	4	PC
	PE3	3	0	2	4	PE
	PE4	0	1	2	2	PE
	EO1	3	0	0	3	EO
	OE1	3	0	0	3	OE
Total		**15**	**1**	**8**	**20**	

Semester - VII						
Course Code	**Course**	**L**	**T**	**P**	**C**	
	Introduction to Distributed and parallel Computing	3	0	2	4	PC
	EO2	3	0	0	3	EO
	PE5	3	0	0	3	PE
	PE6	3	0	2	4	PE
	OE 2	3	0	0	3	OE
	Research/ Industrial Internship	0	0	0	3	PI
Total		**15**	**0**	**4**	**20**	

Semester – VIII						
Course Code	**Course**	**L**	**T**	**P**	**C**	
	B.Tech. Project	0	0	36	18	PI
Total		**0**	**0**	**36**	**18**	

MS	Mathematics & Statistics
SC	Natural Science (Physics, Chemistry, Biology), Environmental Science
HS	Humanities, Social Science, Literature, Management & Soft-skills (including Electives)
PC	Core Engineering Courses (from the branch of study)
OC	Core Engineering Courses (from the other branch of Engineering)
PE	Program Elective (from the branch of study)
EO	Elective (from other branch of Engineering)
OE	Open Elective (Science / Humanities / Engineering: not more than one from each)
PI	Projects, Internships (Research/Industrial)

3.2. List of Electives:

3.2.1. Program Electives (PE1 to PE6):

Course Category	List of Courses
PE (with Lab) PE1, PE3 and PE6	Natural Language Processing, Data Analytics, Speech Science, Computer Graphics and Animation, Information Retrial, Wireless Sensor Networks, Web Application Security, Human Computer Interaction, Enterprise Resource Planning, Computer Vision, Embedded System, Software Project Management (CS), Advanced Computer Networks, Advanced DBMS
PE (without Lab) PE2 and PE5	Cloud Computing Security, Internet of Things, Modeling and Simulation, Data Compression, Cyber Security, Compiler Design, Advanced Computer Architecture, Bio-Informatics, Logic for computer Science, PPL, Pattern Recognition, Software Verification, Approximation Algorithms, Security Protocols
PE4 (Lab course)	VHDL Lab, Parallel Programming Lab, Robotics Lab, HPC Lab

3.2.2. Electives from other branch of Engineering (EO1 and EO2):

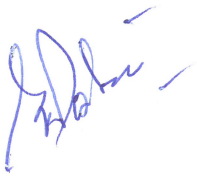
Course Category	List of Courses
EO1 and EO2	Digital Image Processing, Deep Learning, Information Theory Coding, Cognitive Science, Soft Computing, Advanced Image processing, Graph Theory, Low power circuit Design, Real-time system, neno Science, VLSI Design, E-Commerce,

3.2.3. Open Electives (OE1 and OE2):

Course Category	List of Courses
OE1 and OE2	Operation Research, Network Flow Aglorithms, Professional Ethics, Quantum Computing, Game Theory

3.3. Course Contents:

3.3.1. To be uploaded later:



Chapter 4

B.Tech. in Information Technology

4.1. Course Structure: The proposed course structure for B.Tech in Information Technology is tabulated below. The existing course structure, approved by the Academic Council in the academic year of 2013-14, is provided in Appendix B for reference.

Semester wise Courses: B.Tech. in Information Technology						
Semester - III						**Course Category**
Course Code	**Course**	**L**	**T**	**P**	**C**	
	Environmental Science	2	0	0	2	SC
	Object Oriented Design & Programming	3	0	3	5	PC
	Digital Logic Design	3	0	2	4	PC
	Design and Analysis of Algorithms	3	0	3	5	PC
	Technical Writing	1	1	2	3	HM
	Probability and Statistics	3	1	0	4	MS
Total		**15**	**2**	**10**	**23**	

Semester - IV						
Course Code	**Course**	**L**	**T**	**P**	**C**	
	Web Technology	3	0	2	4	PC
	Database Management System	3	0	3	5	PC
	Operating Systems	3	0	3	5	PC
	Economics	3	0	0	3	HM
	Computer Organization and Architecture	3	0	2	4	PC
Total		**15**	**0**	**10**	**21**	

Semester - V						
Course Code	**Course**	**L**	**T**	**P**	**C**	
	Computer Networks	3	0	2	4	PC
	Software Engineering	3	0	3	5	PC
	Information Security	3	0	2	4	PC
	PE1	3	0	2	4	PE
	PE2	3	0	0	3	PE
	Design Project	0	0	0	3	PI

Total		**15**	**0**	**9**	**23**	

Semester - VI						
Course Code	**Course**	**L**	**T**	**P**	**C**	
	Software Project Management	3	0	3	5	PC
	Management Information System	3	0	0	3	PC
	PE3	3	0	2	4	PE
	PE4	0	1	2	2	PE
	EO1	3	0	0	3	EO
	OE1	3	0	0	3	OE
Total		**15**	**1**	**7**	**20**	

Semester - VII						
Course Code	**Course**	**L**	**T**	**P**	**C**	
	System Administration and Maintenance	2	0	3	4	PC
	EO2	3	0	0	3	EO
	PE5	3	0	0	3	PE
	PE6	3	0	2	4	PE
	OE2	3	0	0	3	OE
	Research/ Industrial Internship	0	0	0	3	PI
Total		**14**	**0**	**5**	**17**	

Semester – VIII						
Course Code	**Course**	**L**	**T**	**P**	**C**	
	BTech. Project	0	0	36	18	PI
Total		**0**	**0**	**36**	**18**	

4.2. List of Electives:

4.2.1. Program Electives (PE1 to PE6):

Course Category	**List of Courses**
PE (with Lab) PE1, PE3 and PE6	Natural Language Processing, Data Analytics, Speech Science, Computer Graphics and Animation, Information Retrial, Wireless Sensor Networks, Web Application Security, Human Computer Interaction, Enterprise Resource Planning, Computer Vision, Embedded System, Advanced Computer Networks, Advanced DBMS, Artificial

	Intelligence (IT), Introduction to Distributed and parallel Computing (IT)
PE (without Lab) PE2 and PE5	Cloud Computing Security, Internet of Things, Modeling and Simulation, Data Compression, Cyber Security, Advanced Computer Architecture, Bio-Informatics, Logic for computer Science, PPL, Pattern Recognition, Software Verification, Approximation Algorithms, Security Protocols
PE4 (Lab course)	VHDL Lab, Parallel Programming Lab, Robotics Lab, HPC Lab

4.2.2. Electives from other branch of Engineering (EO1 and EO2):

Course Category	List of Courses
EO1 and EO2	Digital Image Processing, Deep Learning, Information Theory Coding, Cognitive Science, Soft Computing, Advanced Image processing, Graph Theory, Low power circuit Design, Real-time system, neno Science, VLSI Design, E-Commerce.

4.2.3. Open Electives (OE1 and OE2):

Course Category	List of Courses
OE1 and OE2	Operation Research, Network Flow Algorithms, Professional Ethics, Quantum Computing, Game Theory.

4.3. Course Contents:

4.3.1. To be uploaded later

Chapter 5

B.Tech. in Electronics and Communication Engineering

5.1. Course Structure: The proposed course structure for B.Tech in Electronics and Communication Engineering is tabulated below.

Semester	Course Code	Course	L	T	P	C	Course Category
Semester - III		Probability and Random Processes	3	1	0	4	MS
		Environmental Science	2	0	0	2	SC
		Technical Writing	1	1	2	3	HM
		Principles of Communication	3	0	0	3	PC
		Signals and System Theory	3	1	0	4	PC
		Network Analysis and Synthesis	3	1	0	4	PC
		Principles of Communication Laboratory	0	0	3	2	PC
	Semester - III : Total		15	4	5	22	
Semester - IV		Numerical Methods	3	0	2	4	MS
		Economics	3	0	0	3	HM
		Analog Circuits	3	1	0	4	PC
		Digital Circuits	3	1	0	4	PC
		Control Systems	3	1	0	4	PC
		Analog Circuits Laboratory	0	0	3	2	PC
		Digital Circuits Laboratory	0	0	3	2	PC
	Semester - IV : Total		15	3	8	23	
Semester - V		Introduction to Life Science	3	0	0	3	SC
		Digital Signal Processing	3	0	2	4	PC
		Digital Communication	3	0	0	3	PC
		Digital Communication Laboratory	0	1	3	3	PC
		PE1	3	1	0	4	PE
		RF and Microwave Circuits	3	0	2	4	PC
		Design Project	0	0	0	3	PI
	Semester - V : Total		15	2	7	24	
Semester - VI		Information Theory and Coding	3	1	0	4	PC
		PE2	3	0	2	4	PE

		Microprocessor and Microcontroller Laboratory	0	1	3	3	PC
		Computer Organization and Architecture	3	0	2	4	PC
		EO1	3	0	0	3	EO
		OE1	3	0	0	3	OE
	Semester - VI : Total		15	2	7	21	
Semester - VII		PE3	3	0	0	3	PE
		PE4	3	0	0	3	PE
		PE5	3	0	0	3	PE
		PE6 : Laboratory course	0	1	3	3	PE
		EO2	3	0	0	3	EO
		OE2	3	0	0	3	OE
		Research/Industrial Project	0	0	0	3	PI
	Semester - VII : Total		15	1	3	21	
Semester - VIII		B.Tech. Project	0	0	36	18	PI
	Semester - VIII : Total		0	0	36	18	

MS	Mathematics & Statistics
SC	Natural Science (Physics, Chemistry, Biology), Environmental Science
HS	Humanities, Social Science, Literature, Management & Soft-skills (including Electives)
PC	Core Engineering Courses (from the branch of study)
OC	Core Engineering Courses (from the other branch of Engineering)
PE	Program Elective (from the branch of study)
EO	Elective (from other branch of Engineering)
OE	Open Elective (Science / Humanities / Engineering: not more than one from each)
PI	Projects, Internships (Research/Industrial)

5.2. List of Electives:

5.2.1. Program Electives (PE1 to PE6):

Design and Analysis of Algorithms

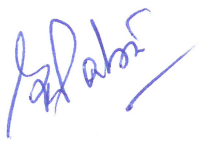
Computer Networks
Wireless Communication
Optical Communication
Digital Image Processing
Computer Vision
Introduction to VLSI
Antenna and Wave Propagation
Operating Systems
Robotics
Embedded Systems
Antenna and Wave Propagation
Internet of Things
Advance Control Systems
Adaptive Signal Processing
Statistical Signal Processing
Data Compression
Compressive Sensing
Graph Signal Processing
Power Electronics

5.2.2. Electives from other branch of Engineering:

5.2.3. Open Electives:

5.3. Course Contents:

5.3.1. To be uploaded later



Chapter 6

Course Evaluation Policy and Graduation Requirements

6.1. Course Evaluation Policy:

The weightage of components in overall evaluation should have

1. Min 15% for each in-semester examination.
2. Min 45% for end-semester examination.
3. Max 25% for continuous evaluation which include quizzes, assignments, viva & projects.

6.2. Graduation Requirements:

All B.Tech. students should secure

1. Registered and cleared (with minimum pass grade) all core course credits of 108 units (minimum).
2. Registered and cleared (with minimum pass grade) all elective courses credits of 32 units (minimum).
   i. Minimum Five Engineering Electives from Program Electives.
   ii. Minimum Two Engineering Electives from Other Electives.
   iii. Minimum Two Open Electives (not more than one from each Sciences, Engineering and Humanities & Social Science).
3. Registered and cleared (with pass grade) the following of (credits of 6 units)
   i. Summer Design Project
   ii. Research/Industrial Internship
4. Registered and cleared (with passing grade) B.Tech. project (credits of 18 units).
5. Earned minimum 146 credits excluding the B.Tech. project and all P/F courses.
6. Earned minimum 730 grade points excluding the B.Tech. project and all P/F courses

Table: Graduation requirements for various branches of studies

S.No	Mandatory Requirements	Branch wise Credits		
		CSE	IT	ECE
1.	**Registered and cleared (with minimum pass grade) all Core Courses**			
1.1	Mathematics and Statistics	12	12	12
1.2	Basic Sciences (Physics, Chemistry, Biology) & Environmental Science	12	12	12
1.3	Humanities, Social Science, Literature, Management, Soft-skills	12	12	12
1.4	Program Core (Branch specific)	60	60	60
1.5	Program Core (Other Engineering Branches)	12	12	12
	Total	108	108	108
2.	**Registered and cleared (with minimum pass grade) all Elective Courses**			
2.1	Program Electives (Branch specific)	20	20	20
2.2	Elective (other Engineering Branches)	6	6	6
2.3	Open Elective (science, humanities, engineering)	6	6	6
	Total	32	32	32
3.	**Registered and cleared (with pass / minimum pass grade) Projects/Internship**			
3.1	Summer Design Project	3	3	3
3.2	Research / Industrial Internship.	3	3	3
3.3	B.Tech Project	18	18	18
	Total	24	24	24
	Overall Total Credits	164	164	164

6.3. Grading Policy:

1. A student is awarded alphabetical letter grade in each course he/she is registered for, including his/her overall performance in that course. There are eleven letter grades: AA, AB, BB, BC, CC, CD, DD, F and I. The correspondence between grades and points (on a 10-point scale) / rating is given below:

Existing Grading Scheme		**Proposed Grading Scheme**	
Letter Grade	**Points (10-point scale)**	**Letter Grade**	**Points (10-point scale)**
AA	10	AA	10
AB	9	AB	9
BB	8	BB	8
BC	7	BC	7
CC	6	CC	6
CD	5	CD	5
DD	4	DD	4
DE	3	F	0
F	0	P	Pass
P	Pass	I	Incomplete
I	Incomplete		

2. If a student does not complete all the requirements for a course for a genuine reason, the instructor may award grade I (Incomplete). An I grade must be converted by the instructor to a regular letter grade by the last date for such conversion specified in the Academic Calendar, failing which it is automatically converted to an F grade.

3. A student getting an F grade in a course must either repeat it or substitute it by another course as suggested by PIC Academics.

4. A student getting a DD grade in a course may be allowed to repeat it or substitute it by another course, provided (*i*) his/her CPI is less than the prescribed minimum and the

student is allowed to continue in the programme as per provision in the Academic Performance Requirement, and (*ii*) he/she has completed all the courses as prescribed by the branch.

5. In case a course is repeated or substituted, the old grade will also appear on the transcript although it will not be taken into account while computing the CPI/SPI.
6. Seminars will be graded as Pass (P) or Fail (F) and will carry zero units for credit. The grade P or F will be awarded for project units as follows: At the end of the semester, the project supervisor(s)/a committee of experts will assess the student's progress towards the project work during the semester and will award the grade P if the work is satisfactory and F for unsatisfactory work.
7. If a student is on leave for a part of the semester or submits his/her project report in the middle of a semester, the PIC academics may reduce his/her thesis/project units appropriately.

6.4. Computation of the Semester Performance Index (SPI) and Cumulative Performance Index (CPI)

The SPI is an indicator of the overall academic performance of a student in all the courses he/she has registered during a given semester. It is computed as follows:

If the grades awarded to student are G_1, G_2, etc. in courses with corresponding units U_1, U_2, etc., the SPI is given by

$$SPI = (U_1G_1 + U_2G_2 + ...) / (U_1 + U_2 + ...)$$

In the above computation, courses with P grades are ignored. Similarly, the CPI indicates the cumulative academic performance in all the courses taken including those taken in the current semester as

$$CPI = \frac{1}{Total\ Credits} \sum_{i=1}^{8} (SPI \times Total\ credit)\ of\ ith\ Semester$$

Appendix A

Approved Curriculum (2013-14): B.Tech. in Computer Science and Engineering

Courses (CSE)

Semester - I

CSE

	L	T	P	C
Introduction to Discrete Mathematics	3	1	0	4
Physics	3	1	2	5
Introduction to Programming	2	0	0	2
Introduction to Programming Lab	0	1	4	3
Digital Logic Design	3	0	4	5
Spoken and Written Communication	2	0	0	2
Total Credit				**21**

Semester - II

CSE

	L	T	P	C
Calculus	3	1	0	4
Data Structure	3	0	0	3
Data Structure Lab	0	1	4	3
Basic Electronics Circuits	3	1	2	5
Computer Organization	3	0	4	5
Introduction to Computer Science	1	0	2	2
Total Credit				**22**

Semester - III

CSE

	L	T	P	C
Object Oriented Design & Programming	3	0	0	3
Object Oriented Design & Programming LAB	0	1	4	3
Operating system	3	0	4	5
Systems and Signal Theory	3	0	2	4
Probability and Statistics	3	1	0	4
Economics	3	0	0	3
Total Credit				**22**

Semester - IV

CSE

	L	T	P	C
Database Management System	3	0	0	3
Database Management System LAB	0	1	4	3
Computer Networks	3	0	0	3
Computer Networks LAB	0	1	4	3
Design and Analysis of Algorithm	3	0	2	4
Science Technology and Society	3	0	0	3
Technical Writing	1	0	4	3
Total Credit				**22**

Summer-I

CSE

	L	T	P	C
Design Project*	0	0	6	3

*Pass/Fail

Semester - V

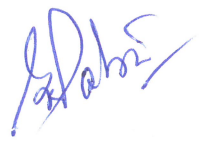
CSE

	L	T	P	C
Principles of Programming Language	3	0	0	3
Formal Language & Automata Theory	3	0	2	4
Software Engineering	3	0	0	3
Software Engineering LAB	0	1	4	3
Numerical Linear Algebra	3	0	0	3
Environmental Science	3	0	0	3
(SC) Elective - 1	3	0	0	3
Total Credit				**22**

Semester - VI

CSE

	L	T	P	C
Complier Design	3	0	0	3
Complier Design LAB	0	1	4	3
Introduction to Artificial Intelligence	3	0	2	4
Computer Architecture	3	0	2	4
Introduction to Cryptography & Security	3	0	0	3
(SC) Elective - 2	3	0	0	3
(HM) Elective - 1	3	0	0	3
Total Credit				**23**



Summer-II				
CSE				
	L	T	P	C
Research / Industrial Internship*	0	0	6	3

*Pass/Fail

Semester - VII				
CSE				
	L	T	P	C
Professional Ethics	2	0	0	2
Distributed Computing	3	0	2	4
(TE) Elective - 1	3	0	2	4
(TE) Elective - 2	3	0	2	4
(TE) Elective - 3	3	0	2	4
(TE) Elective - 4	3	0	0	3
Total Credit				**21**

Semester - VIII				
CSE				
	L	T	P	C
Project	0	0	36	18
Total Credit				**18**

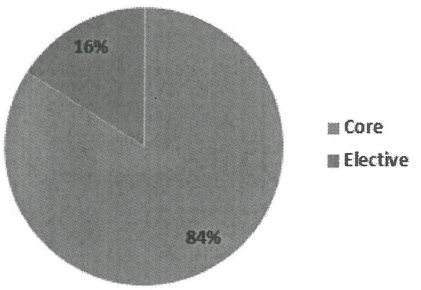
Possible Electives

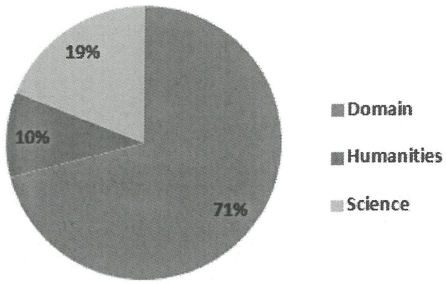
Category	Subjects
(HM) Elective - 1	Introduction to Business and Finance, Principles of management, Approaches to Indian society, Rural Development, Organizational behavior, Science Fiction, Film appreciation, Indian constitution
(SC) Elective - 1	Numerical methods, Optimization, Graph theory, Game theory, Algebraic structure, Bioinformatics, Coding Theory
(SC) Elective - 2	Dynamical systems, Modeling and simulations, Stochastic simulation, Nano science, Quantum computer, Logic for Computer Science
(TE) Elective -1	Model of Computation, Data analytics, Big Data, Computer vision, Speech processing, Wireless Sensor Networks
(TE) Elective -2	Robotics, Image processing, Management Information Systems, Digital rights management, Machine Learning,
(TE) Elective -3	Information Retrieval, Dynamics of Animation, Biotechnology, Service Oriented Computing
(TE) Elective -4	Pattern Recognition, soft Computing, Human computer Interaction, E-commerce, Information Security, web Technology

Structure of the Curriculum

- Total Credits requirement – 153 for graduation
- Credits requirement – 24 for Internship and Projects.
- Design (Summer) project after Semester IV (credit not counted for graduation requirement. It is a pass/Fail course). Students are expected to carry out a development (software/hardware) project preferably in a group of 2 – 4 students. Duration would be 6 – 8 weeks.
- Research or Industrial Internship in summer after Semester VI (credit not counted for graduation requirement. It is a Pass/Fail course). This is individual internship. Students can choose either research within/outside institute or can choose an industry internship. Typical duration would be 6-8 weeks.
- One full semester project (credit not counted for graduation requirement. This credit would be considered for computation of CPI). This is enabling students to take project in industry or any other research organization.

- 19% of the total credit is for science courses
- 10% of the total credit is for humanities courses
- Science elective 2 in numbers
- Humanities elective 1 in numbers





Semester - I

Introduction to Discrete Mathematics (3-1-0-4)

Course Contents:

Appendix B

Approved Curriculum (2013-14): B.Tech. in Information Technology

Courses (IT)

Semester – I

IT

	L	T	P	C
Introduction to Discrete Mathematics	3	1	0	4
Physics	3	1	2	5
Introduction to Programming	2	0	0	2
Introduction to Programming Lab	0	1	4	3
Digital Logic Design	3	0	4	5
Spoken and Written Communication	2	0	0	2
Total Credit				**21**

Semester - II

IT

	L	T	P	C
Calculus	3	1	0	4
Data Structure	3	0	0	3
Data Structure Lab	0	1	4	3
Basic Electronics Circuits	3	1	2	5
Computer Organization	3	0	4	5
Introduction to Information Technology	1	0	2	2
Total Credit				**22**

Semester - III

IT

	L	T	P	C
Object Oriented Design & Programming	3	0	0	3
Object Oriented Design & Programming LAB	0	1	4	3
Information Technology in Knowledge Society	3	0	2	4
Algorithms and Problem Solving	3	0	2	4
Probability and Statistics	3	1	0	4
Economics	3	0	0	3
Total Credit				**21**

Semester - IV

IT

	L	T	P	C
Database Management System	3	0	0	3
Database Management System LAB	0	1	4	3
Operating Systems	3	0	0	3
Operating Systems LAB	0	1	4	3
Operations Research	3	1	0	4
Science Technology and Society	3	0	0	3
Technical Writing	1	0	4	3
Total Credit				**22**

Summer-I

IT

	L	T	P	C
Rural Internship *	0	0	6	3

*Pass/Fail

Semester - V

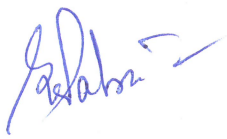
IT

	L	T	P	C
Computer Networks	3	0	0	3
Computer Networks LAB	0	1	4	3
Software Engineering	3	0	2	4
Web Technology	3	0	2	4
Information Security	3	0	0	3
Environmental Science	3	0	0	3
(SC) Elective - 1	3	0	0	3
Total Credit				**23**

Semester - VI

IT

	L	T	P	C
Software Project Management	3	0	2	4
Human Computer Interaction	3	0	0	3
Human Computer Interaction LAB	0	1	2	2
Introduction to Information Retrieval	3	0	2	4
E-Commerce	3	0	0	3
(TE) Elective – 1	3	0	0	3
(HM) Elective - 1	3	0	0	3
Total Credit				**22**



Summer-II				
IT				
	L	T	P	C
Research / Industrial Internship*	0	0	6	3

*Pass/Fail

Semester - VII				
IT				
	L	T	P	C
Professional Ethics	2	0	0	2
Management Information Systems	2	1	0	3
System Administration and Maintenance	2	0	4	4
(SE) Elective - 2	3	0	0	3
(TE) Elective - 2	3	0	2	4
(TE) Elective - 3	3	0	2	3
(TE) Elective - 4	3	0	0	3
Total Credit				**22**

Semester - VIII				
IT				
	L	T	P	C
Project	0	0	36	18
Total Credit				**18**

Possible Electives

Category	Subjects
(HM) Elective – 1	Introduction to Business and Finance, Principles of Management, IT in Rural Development, Modernity and Political Theory, Approaches to Science Fiction, Approaches to Indian Society, …
(SC) Elective – 1	Numerical Methods, Graph Theory, Combinatorial Games, Algebraic Structures, Optimization Techniques, Quantum Mechanics, …
(SC) Elective – 2	Modeling and Simulation, Nano Science, Bio-informatics, Number Theory, Modern Optics, Statistical Data Analysis, …
(TE) Elective – 1	Distributed Systems, Digital Architecture Systems, Semantic Web, Embedded Systems, Software Testing & Quality, Models of Computation, Verification and Specification, …
(TE) Elective – 2	Information Assurance, Digital Rights Management, Financial Technologies, Healthcare Systems, Cryptography & Coding Theory, The Constitution of India, Cyber Crimes & Law, …
(TE) Elective – 3	Machine Learning, Artificial Intelligence, Data Analytics, Big Data, Image Processing, Pattern Recognition, Computer Vision, Speech Processing, …
(TE) Elective – 4	Enterprise Resource Planning, e-Business, e-Governance, Entrepreneurship Development, Mobile Technologies, …

Structure of the Curriculum

- Total Credits requirement – 153 for graduation
- Credits requirement – 24 for Internships and Projects.
- Rural Internship after Semester IV (credit not counted for graduation requirement. It is a pass/Fail course)
- Research or Industrial Internship in summer after Semester VI (credit not counted for graduation requirement. It is a Pass/Fail course)
- One full semester project (credit not counted for graduation requirement. This credit would be considered for computation of CPI). This is enabling students to take project in industry or any other research organization.

- 70% of the total credit is for IT courses
- 20% of the total credit is for science courses
- 10% of the total credit is for humanities courses
- Technical elective 4 in numbers
- Science elective 2 in numbers
- Humanities elective 1 in number

Semester - I

Introduction to Discrete Mathematics (3-1-0: 4)

Course Contents:

FOUNDATION: Propositional and predicate logic, logical equivalences, predicates and quantifiers, translation from language to logical expressions, nested quantifiers, set theory, set operations, set identities and functions, inverse and composition functions, graph of functions.

NUMBER THEORY: Division operator, prime factorization, properties of prime numbers, prime number theorem, GCD and LCM, modular arithmetic and applications, sequences and summations.

COUNTING: Permutation and combinations, pigeonhole principle, inclusion-exclusion principle, binomial theorem, Pascal identity and triangle.

MATHEMATICAL REASONING and INDUCTION: Rules of inference, direct proof, proof by contradiction, proof by contrapositive, mathematical induction and second law of mathematical induction.

RECURSION: Definition, recursive algorithm, recurrence relations, solving recurrence relations.

RELATIONS: Relations and their properties, applications and representations, equivalence relations, partial ordering, Hasse diagram.

GRAPHS: Introduction and terminology, representation, isomorphism, connectivity, Warshall's algorithm, Euler and Hamilton path, shortest path.

TEXT BOOK:
Discrete Mathematics and its Application, 7th Ed, K. Rosen, Tata McGraw Hill, 2011.

REFERENCE BOOK:
1) Discrete Mathematical Structure, 4th Ed, B. Kolman, R.C. Busby and S. C. Ross, PHI, 2000.
2) Discrete Mathematics, Richard Johnsonbaugh, Prentice Hall, 2007.
3) Mathematics: A Discrete Introduction, 3rd Ed., Edward R. Scheinerman, Cengage Learning, 2006.
4) Mathematical Structure for Computer Science, 6th Ed, J. Gersting, Freeman, 2006.

Physics (3-1-2: 5)

Course Contents:

COORDINATE SYSTEM: Cartesian, cylindrical and spherical coordinates; unit vectors and their time derivatives.

REVIEW OF PARTICLE DYNAMICS: Inertial and non-inertial frames of reference, centrifugal and coriolis forces; conservative force, work-energy theorem; centre of mass, conservation of momentum; collision in one and two dimensions. small oscillations, free, forced and damped oscillations.

Appendix C

Minutes of the Workshop on 'Undergraduate Curriculum Revision and Development

A.1. Agenda of the Workshop:

A one day workshop on 'Undergraduate Curriculum Development and Revision' was organized on 8th December 2017 with the following agenda:

1. Fixation of the total credits and of the UG programmes.
2. Fixation of the credit distribution for Engineering, Mathematics, Science, Humanities and Soft-skills courses.
3. Fixation of the common courses for 1st year.
4. Development of curriculum for B.Tech in Electronics and Communication Engineering.
5. Revision of the curricula of existing B.Tech. programs in Computer Science and Engineering and Information Technology in an over comprehensive manner.

A.2. Participants of the Workshop:

S.No.	Name	Affiliation
1.	Prof. S. K. Patra	Director, IIIT Vadodara
2.	Prof. K. S. Dasgupta	Director, DAIICT, Gandhinagar
3.	Prof. D. K. Subramanian	Professor (Rtd.), CSE, IISc Bangalore
4.	Prof. Anup Ray	Professor (Rtd.), CET, IIT Kharagpur
5.	Prof. Ajit Pal	Professor (Rtd.), CSE, IIT Kharagpur
6.	Prof. P. K. Biswas	Professor, EEC, IIT Kharagpur
7.	Prof. Shankar Prakriya	Professor, EE, IIT Delhi
8.	Prof. Dinesh Garg	Associate Professor, CSE, IIT Gandhinagar
9.	Prof. Biswajit Mishra	Professor, ECE, DAIICT, Gandhinagar

10.	Prof. Manik Lal Das	Professor, IT, DAIICT, Gandhinagar
11.	Dr. Pratik Shah	Assistant Professor, IIIT Vadodara
12.	Dr. Jignesh Bhatt	Assistant Professor, IIIT Vadodara
13.	Dr. Dhirendra K. Sinha	Assistant Professor, IIIT Vadodara
14.	Dr. Ajay Nath	Assistant Professor, IIIT Vadodara
15.	Dr. Kamal Kishor Jha	Assistant Professor, IIIT Vadodara
15.	Dr. Swapnil Lokhande	Assistant Professor, IIIT Vadodara
16.	Dr. Ashish Phophalia	Assistant Professor, IIIT Vadodara
17.	Dr. Keyur Parmar	Assistant Professor, IIIT Vadodara
18.	Dr. Naveen Kumar	Assistant Professor, IIIT Vadodara
19.	Dr. Mayur Punekar	Assistant Professor, IIIT Vadodara

A.3. Recommendations

[Agenda 1]: Fixation of the total credits and of the UG programmes.

As against the existing total credits, i.e., 176 for CSE and 178 for IT programmes, it is proposed to limit total credits between 160 (minimum) and 180 (maximum). It is also proposed that the total credits for graduation requirement will be 170.

[Agenda 2]: Fixation of the credit distribution for Engineering, Mathematics, Science, Humanities and Soft-skills courses.

As per discussion, the proposed distribution of credits is tabulated below:

Distribution of Credits: UG Curriculum		
S.No.	**Area**	**Credits Proposed**
1	Mathematics & Statistics	12
2	Basic Sciences (Physics, Chemistry, Biology), Environmental Science	12

3	Humanities, Social Science, Literature, Management, Soft-skills (Including Electives)	12
4	Core Engineering Courses (from the branch of study)	60
5	Core Engineering Courses (from the other branches of Engineering)	12
6	Program Electives (from the branch of study)	20
7	Electives (from the other branches of Engineering)	6
8	Open Electives (Science / Humanities / Engineering: Not more than one from each)	6
8	Projects, Internships (Research/Industrial)	24
	Total Credits	**164**

[Agenda 3]: Fixation of the common courses for 1st year.

The following common courses are proposed for the 1st year UG programme.

Semester	Course Code	Course	L	T	P	C
Semester - I	**MA111**	Mathematics-I (Linear Algebra and Matrices)	3	1	0	4
	PH110 / PH120	Mechanics and Thermodynamics / Waves and Electromagnetics	3	1	0	4
	PH170 / PH180	Mechanics and Thermodynamics Laboratory / Waves and Electromagnetics Laboratory	0	0	2	1
	IT111	Computer Programming and Problem Solving	3	0	0	3
	IT171	Computer Programming and Problem Solving Laboratory	0	0	3	2
	EL110 / EE 110	Basic Electronic Circuits / Basic Electrical Engineering	3	1	0	4
	EL170 / EE170	Basic Electronic Circuits Laboratory / Basic Electrical Engineering Laboratory	0	0	3	2
	HS111	Spoken and Written Communication	2	0	2	3
	Semester - I : Total		14	3	10	23
Semester - II	**MA112 / MA114**	Mathematics-II (Calculus / Discrete Mathematics)	3	1	0	4

	PH120 / PH110	Waves and Electromagnetics / Mechanics and Thermodynamics	3	1	0	4
	PH180 / PH170	Waves and Electromagnetics Laboratory / Mechanics and Thermodynamics Laboratory	0	0	2	1
	EE110 / EL110	Basic Electrical Engineering / Basic Electronic Circuits	3	1	0	4
	EE170 / EL170	Basic Electrical Engineering Laboratory / Basic Electronic Circuits Laboratory	0	0	3	2
	CS112	Introduction to Data Structures	3	0	0	3
	CS172	Introduction to Data Structures Laboratory	0	1	2	2
	HS112	Science Technology and Society	3	0	0	3
	Semester - II : Total		15	4	7	23
Year - I : Total			**29**	**7**	**17**	**46**

[Agenda 4]: Development of curriculum for B.Tech in Electronics and Communication Engineering

The committee discussed and recommended the courses (Semester III to VIII) for B.Tech in Electronics and Communication Engineering discussed in Chapter 5.

[Agenda 5]: Revision of the curricula of existing B.Tech. programs in Computer Science and Engineering and Information Technology in an over comprehensive manner.

Following recommendations are proposed:

1. Curriculum should follow the ACM guidelines.
2. Broad distribution of courses under the following headings, viz., Programming (e.g., Compiler design, Operating systems, Computer organization, Software engineering), Systems (e.g., Artificial intelligence, Signal processing), and Applications.
3. One or two online courses may be allowed and credits may be considered accordingly.
4. Computer Networks should be termed as Data Communications & Networks, having stronger emphasis on the physical layer design.
5. No subgroups should be formed for offering elective courses. It has to be a single pool of courses.
6. Embedded systems should be offered as a core course. Currently it is being offered as an Elective course.

7. Proposed new elective courses: Cyber Security, *Compiler Design*, Computer Graphics, VLSI designs, Digital Signal Processing (DSP), Robotics, Machine Learning.
8. FPGA based programming should be included in the laboratory of Computer Organization/ Computer Architecture.
9. Computer Organization course should be covered before Computer Architecture course. In this case, Computer Architecture may be offered as an Elective course.
10. ESP should be included in the course of Software Engineering.
11. Soft Computing course to be in lieu of Operations Research or Optimization Techniques.
12. Resequencing of Discrete Mathematics course to be made in the First Year.
13. Operating Systems course should be covered before Computer Network course.
14. Elective course should be offered preferably from 5th semester onward.
15. Python programming language may be included in a programming course.

Based on the above recommendations, the revised curricula of B.Tech. programs in Computer Science and Engineering and Information Technology are discussed in Chapters 3 and 4, respectively.

Annx – V

Indian Institute of Information Technology Vadodara

Office of Registrar

OO: IIITV/2017-18/59 19.03.2018

Office Order: Revised Policy for Evaluation in Case of Absence during the Examinations

1. Our office order No OO/IIITV/2017-18/56 dated 06 March 2018 be treated as cancelled.

2. From academic session Winter 2017-18 the institute is following the revised evaluation pattern as approved by the senate. There are two in-semester examinations each of 01 hour duration and one end-semester examination apart from the continuous evaluation consisting of assignment/ quiz/ project /viva components. The weightage of each of the above components are as follows:

(a) In-semester examination - 1 (min): 15%
(b) In-semester examination - 2 (min): 15%
(c) End-semester examination (min): 45%
(d) Continuous assessment - Projects/Quizzes/Assignments (max): 25%

3. At the beginning of the semester, the course instructor, after taking due approval from the Director, will inform the students about the course evaluation scheme (adhering to the above guidelines).

4. In view of the change in the examination pattern the following is proposed to resolve the issue of absence during examinations:

(a) If a student fails to attend one or more courses in one of the in-semester examinations, due to approved reason(s), the student's evaluation for that exam will be extrapolated based on the other in-semester examination and the end-semester examination (weighted average of the two parts). This will be considered only after due approval of academic committee.

(b) If a student fails to attend both the in-semester examinations, the evaluation for in-semester examinations will be extrapolated based on the end semester examination. Each of such case should be approved by the academic committee. Further, if a student fails in the same course for which he/she could not appear for both in-semester examinations, the supplementary examination will replace only the end semester examination component and the in-semester examination evaluation will be extrapolated based on the performance in the regular end-semester examination.

(c) If a student fails to attend the end-semester examination due to the approved reason, the student may be permitted to appear for supplementary examination in the subsequent semester.

In following cases a student may represent his case of absence in any of the examination by applying to the academic cell. The application form must be supported by necessary documents.

(a) Medical emergency of self which includes hospitalization only and bed rest advised by the doctor.
(b) In case of calamity in family involving parents/ siblings.
(c) Emergency medical treatment under life threatening condition for parents & siblings.
(d) Participating in inter institute events where the candidate is sponsored by the Institute.
(e) Any other reason permitted by director on case by case basis.

Registrar

Distribution:-

Director – for information please
All faculty/ Staff – By email
All Students. – By email
Office Copy

APPLICATION FORM FOR REPORTING / INTIMATING ABSENCE DURING IN- /END- SEMESTER EXAMINATION(S)

Date:
Name of the Student: Student ID:
Branch: Program:

OTHER DETAILS

Fees Status : ALL FEES PAID / PARTIALLY PAID
Amount Due (From Accounts Section):
CPI Till Previous Semester :
Examination(s) Missed: IN-SEMESTER 1 / IN-SEMESTER 2 / END SEMESTER:
Reason of Absence (Encl. all supporting documents):

Course Details:

Ser No.	Course code	Course Name	Instructor	Exam Date

SIGNATURE OF STUDENT

Recommendation of Faculty Advisor

ANNEXURE – VI

(Exempted under Section 8 (1) (g) of RTI Act 2005)

ANNEXURE – VII

(Exempted under Section 8 (1) (g) of RTI Act 2005)

Annx- VIII

Indian Institute of Information Technology Vadodara

Office of Registrar

OO: IIITV/2017-18/ 49

08 .2.2018

NORMS FOR TA/DA TO STUDENTS FOR DOMESTIC AND INTERNATIONAL TRAVEL ON ACADEMIC ACTIVITIES

Following guidelines only cover the financial aspect TA/DA to students for Domestic and International Travel. It may be noted that all travel need to be pre-approved by the Director on case to case basis. Also, Qualitative Requirements for considering support will be governed by a separate policy.

Norms for Domestic Travel

TA/DA of students on domestic travel can be regulated by the following two categories:

Category of Students	Entitlement
PhD Students and M.Tech Students. (Post graduate students in general)	Limited to the Government of India Norms for TA/DA entitlement of Grade Pay 4200/- level staff (Revised Scale, level 6: 35,400/-). • Reimbursement for hotel accommodation/ guest house of up to Rs 750/- per day. • Reimbursement of non-AC taxi charges of up to Rs 225/- per day for travel within the city. • Reimbursement of food bills not exceeding Rs 800/- (currently restricted to Rs 500/-) per day. • Travel by AC-II/ CC Chair car. Travel by AC-III/ CC Chair car. Travel by road will be restricted to equivalent AC-II train.
B.Tech Students. (Under graduate students in general)	Limited to the Government of India Norms for TA/DA entitlement of Grade Pay 2000/- level staff (Revised Scale, level 3: 21,700/-). • Reimbursement for hotel accommodation/ guest house of up to Rs 450/- per day. • Reimbursement of non-AC taxi charges of up to Rs 113/- per day for travel within the city. • Reimbursement of food bills not exceeding Rs 500/- (currently restricted to Rs 300/-) per day. Travel by AC-III/ CC Chair car. Travel by road will be restricted to equivalent AC-III train.

- The DA will be paid for the days of the conference/ seminar/ lecture/ event and one day each prefix and suffix to event.
- Clubbing of two events is not permitted.
- All expenditures to be supported by bills.

Norms for International Travel

The travel expense for students going on international tour/ visit will be limited to Air fare in Economy Class. Expenditure incurred on Health Insurance, Visa Fee and Registration Charges, other incidental expenses including local Transportation and stay (restricted to 50%):

Ser No	Country of Visit	DA without any voucher	DA on production of vouchers
1	US/ Canada/ Europe/ Japan/ New Zealand/ Australia	USD 80 per day	(a) Up to US $90 per day for stay, and (b) Fixed US $30 as out of pocket expenditure*.
2	Countries other than mentioned in Ser No 1 above	USD 50 per day	(a) Up to US $60 per day for stay, and (b) Fixed US $30 as out of pocket expenditure*.

Note:

- The DA will be paid for the days of the conference/ seminar/ lecture/ event and one day each prefix and suffix to the event.
- Clubbing of two events is not permitted.
- All expenditures to be supported by bills.
- Students are encouraged to seek funding from other sources like CSIR, DST AICTE, UGC etc to meet remaining expenditure. For details please consult faculty advisors.

* "Out of pocket expenditure" include food, local travel, refreshment and other expenses.

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OO: IIITV/2017-18/ 53 23 .2.2018

Guidelines for Institutional Support to Students for Activities other than Academics

Following guidelines only cover various aspects of financial support to students for Domestic Travel for all activities other than Academics. It may be noted that all travel need to be pre-approved by the Director on case to case basis.

1. Students of IIIT Vadodara will be given financial support from Institute for participating in the following events:

(a) Inter-IIIT technical, cultural, literary and sports meet
(b) Technical, cultural, literary and sports fests organized at IIT/NIT/IIIT or any institution of repute preferably located in the western region of India.

2. The student names for a particular event shall be nominated by the approval of Director through a process conducted by the Sports and Cultural Committee (SCC).

3. In order to avail the financial support, student:
(a) Should not have pending Institute Fee,
(b) Should not have Backlog in the previous semester,
(c) Should have Minimum CPI of 6.0, and
(d) Should not have any disciplinary penalty awarded against him/her in last six months.

4. The financial support to students may be provided for following type of events:

Ser No.	Events	Institutional Support
(a)	Inter-IIIT technical, cultural, literary and sports meet where students participate directly with/ without institute authenticating/ forwarding the application of participation OR Inter institutional Technical, cultural, literary and sports fests organized at IIT/NIT/IIIT or any institution of repute	Students have to participate on their own and if they secure prize (First or Second) in the event, travel, lodging and other expense will be paid as per eligibility second class sleeper return train fare, registration fee; fooding and lodging support (limited to Rs 250 per day for fooding and lodging)
(b)	Inter-IIIT technical, cultural, literary and sports meet where students nominated for any event through a nomination committee under sports	All members of team nominated will be paid travel & lodging expense as per eligibility second class sleeper

	and cultural committee (only one team per event being nominated)	return train fare, registration fee; fooding and lodging support (limited to Rs 250 per day for fooding and lodging)

5. A student seeking financial support from Institute must submit a written application addressed to Director along with details of event preferably three weeks before the event. The application should be recommended by PIC (Student Affairs) and he must certify that the student meets the requirements in para 3 above.

6. In case of winners of prize in an event, the students have to submit an application addressed to the Director along with all details within two weeks of completion of event.

7. Absence for all such leave will be covered under "Attendance and Leave of Absence- Students" circulated vide OO:IIITV/2017-18/40 dated 15 Jan 2018 and amended time to time; unless and until specially mentioned by the Director in the approval order.

Note:-

- The DA will be paid for the days of the registered event and one day each prefix and suffix to event.
- Clubbing of events in two different institutes in the same station is permitted but registration fees would be paid only for one institute.
- All expenditures to be supported by bills.
- **The amounts mentioned are the upper limits and subject to availability of funds. The institute can restrict the funding on case to case basis based on availability and projection of funds and commitments.**
- No money will be paid (money may be refunded) if it is found that the student does not meet the criteria laid above and the approval was given erroneously/ shortage of time or in-sufficient/ in-correct information provided to the sanctioning authorities.
- All funds will be paid out of Gymkhana and Cultural Fees Head unless specifically specified by Director in his approval order.

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All faculty/ Staff – by email
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Indian Institute of Information Technology Vadodara

Office of Registrar

OO: IIITV/2017-18/62 26.03.2018

Office Order: Guidelines for Institutional Support to Participate in Academic Research and Outreach Activities

1. To promote research and outreach activity at various level, students of IIIT Vadodara (UG and PG) may be provided with financial support from Institute for following events on case to case basis:
   (a) Presenting paper at Workshop/ Conference.
   (b) Delivering an invited talk at Workshop/ Conference

2. The financial support will be extended only if the participation in the event is with IIIT Vadodara affiliation.

3. The student's name for a particular event shall be nominated by the approval of the Director through a process conducted by the Academic Committee.

4. In order to avail the financial support, student:
   (a) Should not have pending Institute Fees.
   (b) Should not have backlog in any of the courses of previous semester.
   (c) Should have minimum CPI of 7.5, and
   (d) Should not have any disciplinary action taken against him/her during last six months before the date of event.

5. The financial support to students may be provided for following events:

Ser No.	Event	Institutional Support
(a)	Presenting paper in Workshop/ Conference under the banner of IEEE/ ACM or equivalent.	Travel Registration Stay (Food/ Lodging)
(b)	Delivering an invited talk at Workshop/ Conference under the banner of IEEE/ ACM or equivalent.	Travel Registration Stay (Food/ Lodging)
(c)	Attending Short Term Course (Applicable only for Ph.D. students)	Travel Registration Stay (Food/ Lodging)

Note:- Items mentioned in para 5(a), 5(b) and 5(c) in the field of **Science, Maths and Humanities** will be considered **for PhD students only** on case to case basis.

6. The financial support for attending events 1 and 2 as mentioned above is limited to:
   (a) Maximum one event for the entire duration of the program for B.Tech. students
   (b) Maximum two for the entire duration of the program for M.Tech. students
   (c) Maximum four for the entire duration of the program for Ph.D. students including one time support for international event.

7. For attending a short term course (event 3).
   (a) Engineering and Sciences: the course must be conducted/ offered at Institute of National Importance
   (b) Humanities and Social Sciences: the course must be conducted/ offered at Central or State funded institutes.

8. A student seeking financial support from Institute must submit a written application addressed to the Director along with details of event, at least three weeks before the event. The application should be recommended by PIC (Academics) after due check on requirements in para 3 above.

9. Absence in regular semester due to such cases will be covered under **"Attendance and Leave of Absence - Students" circulated vide OO: IIITV/2017-18/40 dated 15th Jan, 2018 and amended time to time**; unless and until specially mentioned by the Director in the approval order.

10. On return from the Conference/ Workshop, the student is required to submit a detailed report about the event to academic committee and present the paper and/ or deliver the talk at IIIT Vadodara on the day and time as decided by the academic committee in consultation with the student.

11. Amount of financial support will in line with the norms as published vide Institute office order OO: IIITV/2017-18/49 dated 08 Feb 2018 and amended from time to time.

This has the approval of Director

Registrar

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Annx- IX

Minutes of the meeting
held on
Jan 25, 2018

The following were present during the meeting

1. Prof. Pratik Shah, IIITV (Chairperson)
2. Prof. Biswajit Mishra, DAIICT (External Member)
3. Prof. Nithin George, IITGn (External Member)
4. Prof. Jignesh Bhatt, IIITV (Member)
5. Prof. Barnali Chetia, IIITV (Secretary)

The director IIITV constituted a committee on 8th Dec, 2017 to analyze the admissions in B.Tech. in Electronics and Communication Engineering (ECE) program in terms of number of seats offered at various national institutes and government engineering colleges in Gujarat.

A meeting was convened to analyze the ECE program in terms of the number of seats offered by various national institutes in India and government colleges in Gujarat.

The data collected (Annexure-1) is summarized below:

Sr. No.	**Institute Name**		ECE		IT		CSE	
		#INS	#Ins	Seats	#Ins	Seats	#Ins	Seats
1	NIT	31	31	1295	7	290	31	1305
2	IIIT	25	17	986	6	380	23	1456
3	Government Colleges (Gujarat)	17	17	3736	6	480	9	825
	Total (Surveyed)	73	65	6017	19	1150	63	3586

(B.Tech./B.E. Seat Matrix for Year 2017-18)

[Observations based on the survey]

1. The number of seats in ECE program is more than combined number of seats in CSE and IT.
2. There are only 19 institutes/colleges that offer IT program.
3. There are only 17 institutes/colleges that offer both CSE and IT programs.
4. There are 65 institutes/colleges offering ECE program and 63 institutes offering CSE program.
5. There are 62 institutes/colleges that offer both ECE and CSE programs.

6. There are 16 IIITs offering both ECE and CSE programs.
7. Majority of the IIITs have preferred to offer ECE and CSE programs considering the strong bonding between two disciplines and is in sync with the IIIT mandate.
8. There is a general perception about admissions to CSE and IT programs due to their similarity which is visible in their student rankings. It becomes a challenge for the institute offering both the programs to clearly bring out the distinction between two disciplines and convince the students opting for them.
9. Newer institutes and some of the established institutes/colleges have been able to attract students with better rankings in ECE program where all the three programs are offered.
10. The institutes set up under PPP mode have to achieve self sustainability eventually. The diversification and expansion of UG and PG programs are crucial for sustainability.

[Recommendations]

1. The trend in the UG engineering/technology programs and their expansions indicate that the introduction of ECE program along with CSE program shall help the institute to meet the long term vision of IIIT Vadodara.
2. For IIIT Vadodara, with the given mandate of self sustainability, it is necessary that the institute expands the B.Tech. program which would widen the scope for further expansions of Masters and PhD programs in the near future.
3. In order to cater to the much needed diversity to grow as an institute of national importance, the B.Tech. program in ECE will enable the institute in creating an interdisciplinary academic and research culture.
4. The ECE program will augment the existing CSE/IT programs and will provide the institute with an opportunity to offer diversified courses. This in turn shall increase the industry acceptance of the graduates.
5. This shall, further, provide better opportunities to students and maximize the scope of expansion of Masters and Research Programs in the institute.
6. Therefore, it is recommended that the B.Tech. in Electronics and Communication Engineering program be introduced early, preferably from the academic year 2018-19.

Pratik Shah	Biswajit Mishra	Nithin George	Jignesh Bhatt	Barnali Chetia
07.02.18	22.02.18	23.02.18	07.02.18	08.02.18

Annexure 1:

Seat availability in B.Tech./B.E. ECE/IT/CSE (All India merit excluding state quota)

	Course offerings, number of seats and opening-closing ranks									
Sr. No.	**Institute Name**	Seats			Open Rank			Close Rank		
	Group A	EC	IT	CSE	EC	IT	CSE	EC	IT	CSE
1	NIT jamshedpur	47		45	8944		4902	15475		9640
2	NIT Calicut	69		69	4048		2111	9612		6616
3	NIT Raipur	45	45	47		9007	6472		16903	12341
4	NIT Trichy	30		30	1048		324	3747		2120
5	NIT Agartala	46		46	12337		1785	27639		20616
6	NIT Allahabad	69	46	77	4377	3017	1785	8823	6260	4068
7	NIT Bhopal	69		92	5874		4329	12168		7949
8	NIT Durgapur	39	30	30	3881	7491	4955	13486	12923	9003
9	NIT Hamirpur	46		46	8423		6574	17668		11881
10	NIT Jaipur	46		47	4570		1934	9237		5931
11	NIT Jalandhar	46		46	8314		2244	15964		9881
12	NIT Kurukshetra	69	46	46	5845	5975	3109	14060	9868	8092
13	NIT Nagpur	46		46	4145		1593	9653		5901
14	NIT Patna	46		60	7751		5471	22035		16017
15	NIT Rourkela	22		45	4578		1925	8837		6396
16	NIT Silchar	60		46	11722		7232	23255		16790
17	NIT Srinagar	39	31	31	17208	12312	12646	36627	36954	29297
18	NIT Warangal	54		54	2405		1126	5064		2604
19	NIT Sikkim	20		23	20808			33488		
20	NIT Meghalaya	15		15	14799		13092	29448		23157
21	NIT Nagland	46	46	46	22126		16830	34495		31431
22	NIT Manipur	15		30	18423		13349	35890		31695
23	NIT Mizorom	15		15	18724		18900	36146		32279
24	NIT Uttarakhand	46		46	10411		9329	24469		18639
25	NIT Goa	15		15	7748		6537	17574		11646
26	NIT Arunachal Pradesh	15		15	16049		10965	35253		26425
27	NIT Delhi	30		30	6204		3421	12094		7816

28	NIT Karnataka(suratkal)	46	46	46	1936	1841	666	5539	5269	2940
29	NIT Puduncherry	30		30	11166		6291	21118		16486
30	NIT Andhra Pradesh	45		45	10030		6298	22993		17448
31	NIT Surat	69		46	5812		2498	11660		6871
	Group B									
1	ABV -Indian Institute of Information Technology and Management, Gwalior			41			6908			12736
2	IIIT, Allahabad	81	140		4756	519		10782	6259	
3	Indian Institute of Information Tehnology, Design and Manufacturing, Chennai	40		40			7594			15995
4	Pandit Dwarka Prasad Mishra Indian Institute of Information Technology, Design and Manufacturing (IIITDM), Jabalpur	100		100	11587		8009	23714		16542
5	Indian Institute of Information Tehnology, Design and Manufacturing (IIITDM),Kurnool, Andhra Pradesh			40	14001			34645		
6	IIIT, Chittoor, Andhra Pradesh	70		200	4288		9321	27590		23084
7	IIIT, Guwahati	35		45	1935		6514	32112		25867
8	IIIT, Kalyani, West Bengal			130			13696			34298
9	IIIT, Una, Himachal Pradesh	60	40	60	19955	19596	14566	35607	33566	28694
10	IIIT, Vadodara Gujarat		60	80		12591	7198		31351	26827
11	IIIT, Kota, Rajasthan	60		60	15446		7063	30321		21853
12	IIIT, Srisangam,Tiruchirappalli, Tamil Nadu	30		30	14102		7818	27711		23021

13	IIIT, Sonepat, Haryana	30	30	30	13771	7165	10240	31372	26817	21979
14	IIIT, Senapati, Manipur	50		50	25306		19509	39507		37474
15	IIIT, Lucknow, Uttar Pradesh		50			11445			24230	
16	IIIT, Kottayam, Kerala			90			15487			33239
17	IIIT, Dharward, Karnataka	40		40	16236		10373	33432		29813
18	IIIT, Pune, Maharashtra	60		60	14867		5092	30704		24754
19	IIIT, Bhopal, Madhya Pradesh	60	60	60	14324	9353	13140	34564	33597	30681
22	IIIT, Nagpur, Maharashtra	90		120	14420		11657	34022		28998
23	IIIT, Ranchi, Jharkhand	60		60	19757		9764	35748		31169
24	IIIT, Surat, Gujarat	60		60	10714		6860	33436		28616
25	IIIT, Bhagalpur, Bihar	60		60	24592			39113		36903
	Group-3									
1	Government Engineering College, Patan	120			10546			32690		
2	Government Engineering College Bharuch	120			10386			21908		
4	Magaraja Sayajirao University	30			Data Not Available					
5	Vishwakarma Government Engineering College	120	60	120	2401	1317	773	5757	1549	1522
6	LD College of Engineering	120	120	120	242	651	52	3371	1033	777
7	Government Engineering College Gandhinagar	120	60	120	4555	1652	1539	9289	2428	2528
8	Government Engineering College Modasa	120	120	120	14640	5438	2388	27844	13812	13371

9	Birla Vishvakarma Maha Vidhyalaya , Vallabh Vidyanagar	60	60	60	3972	997	488	8241	2180	920
10	DDU Faculty Of Technology , Nadiad	45		45	2069		82	3376		310
11	Government Engineering College , Godhra	60			2281			3365		
12	Government Engineering College , Palanpur	60			10310			20535		
13	Government Engineering College , Rajkot	120		120	7510		1208	19979		7660
14	Government Engineering College , Surat	60			3962			9934		
15	Government Engineering College , Dahod	60		60	17548		8048	32331		16453
16	Government Engineering College , Bhuj	120			14395			34889		
17	Government Engineering College, Bhavnagar	120	60	60	6800	4769	2648	23360	7589	5685
	Total Seats	**3736**	**1150**	**3586**						