



R.V. COLLEGE OF ENGINEERING

(Autonomous Institution Affiliated to VTU, Belagavi)

R.V. Vidyaniketan Post, Mysore Road

Bengaluru – 560 059



**Bachelor of Engineering (B.E.)
Scheme and Syllabus for III & IV Semesters**

2016 SCHEME

**ELECTRONICS & COMMUNICATION
ENGINEERING**

Department Vision

Imparting quality technical education through interdisciplinary research, innovation and teamwork for developing inclusive & sustainable technology in the area of Electronics and Communication Engineering.

Department Mission

- To impart quality technical education to produce industry-ready engineers with a research outlook.
- To train the Electronics & Communication Engineering graduates to meet future global challenges by inculcating a quest for modern technologies in the emerging areas.
- To create centres of excellence in the field of Electronics & Communication Engineering with industrial and university collaborations.
- To develop entrepreneurial skills among the graduates to create new employment opportunities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO1.** To apply concepts of mathematics, science and computing to Electronics and Communication Engineering
- PEO2.** To design and develop interdisciplinary and innovative systems.
- PEO3.** To inculcate effective communication skills, team work, ethics, leadership in preparation for a successful career in industry and R & D organizations.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO	Description
PSO1	Should be able to clearly understand the concepts and applications in the field of Communication/networking, signal processing, embedded systems and semiconductor technology.
PSO2	Should be able to associate the learning from the courses related to Microelectronics, Signal processing, Microcomputers, Embedded and Communication Systems to arrive at solutions to real world problems.
PSO3	Should have the capability to comprehend the technological advancements in the usage of modern design tools to analyze and design subsystems/processes for a variety of applications.
PSO4	Should possess the skills to communicate in both oral and written forms, the work already done and the future plans with necessary road maps, demonstrating the practice of professional ethics and the concerns for societal and environmental wellbeing.

Lead Society: IEEE

Abbreviations

Sl. No.	Abbreviation	Meaning
1.	VTU	Visvesvaraya Technological University
2.	BS	Basic Sciences
3.	CIE	Continuous Internal Evaluation
4.	CS	Computer Science and Engineering
5.	CV	Civil Engineering
6.	CHY	Chemistry
7.	EC	Electronics and Communication Engineering
8.	EE	Electrical and Electronics Engineering
9.	ES	Engineering Science
10.	HSS	Humanities and Social Sciences
11.	ME	Mechanical Engineering
12.	PHY	Engineering Physics
13.	SEE	Semester End Examination
14.	MAT	Engineering Mathematics

R.V. College of Engineering, Bengaluru- 560059
(Autonomous Institution Affiliated to VTU, Belagavi)
FIRST SEMESTER CREDIT SCHEME FOR PHYSICS CYCLE

(COMMON TO ALL PROGRAMS)								
Sl. No	Course Code	Course Title	BoS	CREDIT ALLOCATION				Total Credits
				L	T	P	S	
1	16MA11	Applied Mathematics- I	MAT	3	1	0	1	5
2	16PH12	Engineering Physics (Theory and Practice)	Physics	4	0	1	0	5
3	16CV13	Elements of civil Engineering	CV	4	1	0	0	5
4	16ME14	Computer Aided Engineering Drawing (Theory and Practice)	ME	1	0	2	0	3
5	16EE15	Elements of Electrical Engineering	EE	4	0	0	1	5
6	16HSC16	Constitution of India and Legal Studies for Engineers	HSS	2	0	0	0	2
7	16HSK17*	Kannada*	HSS	1	0	0	0	0
		Total No. of Credits						25
		No. Of Hrs.		19	04	6	8**	29

FIRST SEMESTER CREDIT SCHEME FOR CHEMISTRY CYCLE

(COMMON TO ALL PROGRAMS)								
S.No	Course Code	Course Title	BoS	CREDIT ALLOCATION				Total Credits
				L	T	P	S	
1	16MA11	Applied Mathematics-I	MAT	3	1	0	1	5
2	16CH12	Engineering Chemistry (Theory and Practice)	Chemistry	4	0	1	0	5
3	16CS13	Programming in C (Theory and Practice)	CS	4	0	1	0	5
4	16EC14	Basics of Electronic Engineering	ECE	4	0	0	1	5
5	16ME15	Basics of Mechanical Engineering (Theory and Practice)	ME	4	0	1	0	5
6	16HSE16*	Professional Practice-I (Communicative English)	HSS	2	0	0	0	0
		Total No. of Credits						25
		No. Of Hrs.		21	2	6	8**	29

*Mandatory Audit course 2 Hrs per week ** Non contact hours

R.V. College of Engineering, Bengaluru- 560059
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SECOND SEMESTER CREDIT SCHEME FOR PHYSICS CYCLE
(COMMON TO ALL PROGRAMS)

Sl. No	Course Code	Course Title	BoS	CREDIT ALLOCATION				Total Credits
				L	T	P	S	
1	16MA21	Applied Mathematics-II	MAT	3	1	0	1	5
2	16PH22	Engineering Physics (Theory and Practice)	Physics	4	0	1	0	5
3	16CV23	Elements of civil Engineering	CV	4	1	0	0	5
4	16ME24	Computer Aided Engineering Drawing (Theory and Practice)	ME	1	0	2	0	3
5	16EE25	Elements of Electrical Engineering	EE	4	0	0	1	5
6	16HSC26	Constitution of India and Legal Studies for Engineers	HSS	2	0	0	0	2
7	16HSK27*	Kannada*	HSS	1	0	0	0	0
		Total No. of Credits						25
		No. Of Hrs.		19	04	6	8**	29

SECOND SEMESTER CREDIT SCHEME FOR CHEMISTRY CYCLE
(COMMON TO ALL PROGRAMS)

Sl.No	Course Code	Course Title	BoS	CREDIT ALLOCATION				Total Credits
				L	T	P	S	
1	16MA21	Applied Mathematics-II	MAT	3	1	0	1	5
2	16CH22	Engineering Chemistry (Theory and Practice)	Chemistry	4	0	1	0	5
3	16CS23	Programming in C (Theory and Practice)	CS	4	0	1	0	5
4	16EC24	Basics of Electronic Engineering	ECE	4	0	0	1	5
5	16ME25	Basics of Mechanical Engineering (Theory and Practice)	ME	4	0	1	0	5
6	16HSE26*	Professional Practice-I (Communicative English)	HSS	2	0	0	0	0
		Total No. of Credits						25
		No. Of Hrs.		21	2	6	8**	29

*Mandatory Audit course 2 Hrs per week ** Non contact hours

R. V. COLLEGE OF ENGINEERING, BENGALURU – 59.
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF TEACHING AND EXAMINATION

THIRD SEMESTER								
Sl. No.	Course Code	Course Title	BoS	Credit Allocation				Total Credits
				L	T	P	S	
1	16MA31B	Discrete and Integral Transforms	MAT	3	1	0	0	4
2	16ET32	Environmental Technology	BT	2	0	0	0	2
3	16EC33	Analog Microelectronic Circuits	ECE	4	0	1	0	5
4	16EC34	Analysis & Design of Digital Circuits	ECE	3	0	1	1	5
5	16EC35	Network Analysis & Synthesis	ECE	3	1	0	1	5
6	16EC36	Control Systems	ECE	3	0	0	1	4
7	16DCS37	Bridge Course Mathematics*	CSE	2	0	0	0	0
		Total No. of Credits						25
		No. Of Hrs.		18+2*	4	4	12**	

FOURTH SEMESTER								
Sl. No	Course Code	Course Title	BOS	Credit Allocation				Total Credits
				L	T	P	S	
1	16MA41B	Linear algebra and Probability Theory	MAT	3	1	0	0	4
2	16EM42B	Engineering Materials	ECE	2	0	0	0	2
3	16EC43	Advanced Digital System Design using Verilog HDL	ECE	3	0	1	1	5
4	16EC44	Microprocessor & Microcontroller	ECE	3	0	1	1	5
5	16EC45	Signals and Systems	ECE	3	1	0	0	4
6	16EC46	Fields & Waves	ECE	3	0	0	1	4
7	16HS47	Professional Practice-II (Communication Skills and Professional Ethics)	HSS	0	0	0	0	1
8	16DMA48	Bridge Course C Programming *	MAT	2	0	0	0	0
		Total No. of Credits						25
		No. Of Hrs.		19	4	4	12**	

*Mandatory Audit course for lateral entry diploma students **Non-contact hours

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SCHEME OF TEACHING AND EXAMINATION**

FIFTH SEMESTER								
Sl. No	Course Code	Course Title	BOS	Credit Allocation				Total Credits
				L	T	P	S	
1	16HSI51	IPR & Entrepreneurship	HSS	3	0	0	0	3
2	16EC52	Communication System I	ECE	3	1	1	0	5
3	16EC53	Digital VLSI Design	ECE	3	1	1	0	5
4	16EC54	Embedded System Design	ECE	3	0	0	1	4
5	16EC55	Digital Signal Processing	ECE	3	0	0	1	4
6	16EC5AX	Elective A (PE)	ECE	3	0	0	1	4
7	16G5BXX	Elective B (OE)*	Respective BOS	4	0	0	0	4
		Total No. of Credits						29
		No. Of Hrs.		22	4	4	12**	30

*Students should take other department Global Elective courses

Programs	Semester	Course Code/ Course Title	Semester	Course Code / Course Title
EC,CS,EE,IS,TE	5	16HSI51 IPR & Entrepreneurship	6	16HEM61 Essentials of Management and Economics
ME,CH,IM,EL,CV,BT,AS	5	16HEM51 Essentials of Management and Economics	6	16HSI61 IPR & Entrepreneurship

Elective A (PE) 16EC5AX	Elective Title	Elective B (OE) 16G5BXX
16EC5A1	Antennas and Wave Propagation	To be opted from electives offered by other Departments. For more information about other electives see following table
16EC5A2	Transducers & Data Acquisition Systems	
16EC5A3	Artificial Neural Networks & Deep Learning	
16EC5A4	Modelling of semiconductor devices	
16EC5A5	Object Oriented Programming in C++	
16EC5A6	Computer Organization and Architecture	
16EC5A7	Robotics	

PE - PROFESSIONAL ELECTIVE	OE- OTHER ELECTIVES
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Global B Electives offered
V SEMESTER

S.No	Course	Course Code	Offering Dept.
1.	Bioinformatics	16G5B01	Biotechnology
2.	Fuel Cell Technology	16G5B02	Chemical Engineering
3.	Geoinformatics	16G5B03	Civil Engineering
4.	Graph Theory	16G5B04	Computer Science Engineering
5.	Artificial Neural Networks & Deep Learning	16G5B05	Electronics & Communication Engineering
6.	Hybrid Electric Vehicles	16G5B06	Electrical & Electronics Engineering
7.	Optimization Techniques	16G5B07	Industrial & Management Engineering
8.	Sensors & Applications	16G5B08	Electronics & Instrumentation Engineering
9.	Introduction To Management Information Systems	16G5B09	Information Science Engineering
10.	Industrial Automation	16G5B10	Mechanical Engineering
11.	Telecommunication Systems	16G5B11	Telecommunication Engineering
12.	Computational advanced numerical methods	16G5B12	Mathematics
13.	Basics of Aerospace Engineering	16G5B13	Aerospace Engineering

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SIXTH SEMESTER								
Sl. No.	Course Code	Course Title	BOS	Credit Allocation				Total Credits
				L	T	P	S	
1	16HEM61	Foundations of Management & Economics	HSS	2	0	0	0	2
2	16EC62	Communication System II	ECE	4	0	1	0	5
3	16EC63	Computer Communication Networks	ECE	3	0	1	1	5
4	16EC64	Analog & Mixed Signal IC Design	ECE	3	1	0	0	4
5	16EC6CX	Elective C (PE)	ECE	3	0	0	1	4
6	16EC6DX	Elective D (PE)	ECE	3	0	0	1	4
7	16G6EXX	Elective E (OE)*	Respective BOS	3	0	0	0	3
8	16HSE68	Professional Practice-III (Employability Skills and Professional Development of Engineers)\$\$	HSS	1	0	0	0	1
		Total No. of Credits						28
		No. Of Hrs.		22	2	4	12**	28

*Students should take other department Global Elective courses \$\$ 3 days (18 Hrs) in 5th semester and 3 days (18 Hrs) in 6th semester. **Non contact hours

Elective C (PE) 16EC6CX	Elective Title	Elective D (PE) 16EC6DX	Elective Title	Elective E (OE) 16G6EXX
16EC6C1	Cryptography & Network Security	16EC6D1	Optical Fiber Communication & Networks	To be opted from electives offered by other Departments. For more information about other electives see following table
16EC6C2	Real Time Embedded Systems	16EC6D2	ARM Cortex Processors	
16EC6C3	Image Processing	16EC6D3	Adaptive Signal Processing	
16EC6C4	Low power VLSI Design	16EC6D4	System Verilog	
16EC6C5	Data structure using C++	16EC6D5	Algorithm for VLSI Design Automation	
16EC6C6	System Programming & Software	16EC6D6	Database Management Systems(DBMS)	
16EC6C7	Flexible Electronics	16EC6D7	Internet of Things (IoT)	

PE - PROFESSIONAL ELECTIVE	OE- OTHER ELECTIVES
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**Global Electives offered
VI SEMESTER**

S.No	Course	Course Code	Offering Dept.
1.	Bioinspired Engineering	16G6E01	Biotechnology
2.	Green Technology	16G6E02	Chemical Engineering
3.	Solid Waste Management	16G6E03	Civil Engineering
4.	Introduction To Web Programming	16G6E04	Computer Science Engineering
5.	Automotive Electronics	16G6E05	Electronics & Communication Engineering
6.	Industrial Electronics	16G6E06	Electrical & Electronics Engineering
7.	Project Management	16G6E07	Industrial & Management Engineering
8.	Virtual Instrumentation	16G6E08	Electronics & Instrumentation Engineering
9.	Introduction To Mobile Application Development	16G6E09	Information Science Engineering
10	Automotive Engineering	16G6E10	Mechanical Engineering
11	Mobile Network System And Standards	16G6E11	Telecommunication Engineering
12	Partial Differential Equations	16G6E12	Mathematics

B.E., ECE -ELECTIVE COURSES (Consolidated Stream wise)

Local Elective	Semester V	Semester VI		Semester VII	Semester VII
	Sem V-1 (16EC5AX)	Sem VI-1 (16EC6CX)	Sem VI-2 (16EC6DX)	Sem VII-1 (16EC7FX)	Sem VII-2 (16EC7GX)
Hrs/Week: Lecture: Tutorial : Practical's: Self study:	Hrs/Week: 3:0:0:4	Hrs/Week: 3:0:0:4	Hrs/Week: 3:0:0:4	Hrs/Week: 4:0:0:0	Hrs/Week: 4:0:0:0
Credits	4	4	4	4	4
Communications	Antennas & Wave Propagation	Cryptography & Network Security	Optical Fiber Communication & Networks	Satellite Communications & GPS	Radar & Navigation
Embedded Systems	Transducers & Data Acquisition Systems	Real Time Embedded Systems	ARM Cortex Processors	ARM Programming & Optimization	Automotive Electronics
Signal Processing	Artificial Neural Networks & Deep Learning	Image Processing	Adaptive Signal Processing	Speech Processing	Multimedia Communication
VLSI	Modelling of semiconductor devices	Low power VLSI Design	System Verilog/Algorithm for VLSI Design Automation	Radio Frequency Integrated Circuits Design	VLSI Testing for ICs

Computer	Object Oriented Programming in C++ /Computer Organization and Architecture	Datastructure using C++/System Programming & Software	Database Management Systems (DBMS)	High Performance Computing	High Speed digital design
Others	Robotics	Flexible Electronics	Internet of Things (IoT)	Integrated Photonics/Nanoelectronics	MEMS and Smart Systems
Global Elective	Artificial Neural Networks & Deep Learning (Contact Hours:48)	Automotive Electronics (Contact Hours:36)		Image Processing (Contact Hours:36)	

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SEVENTH SEMESTER								
Sl. No	Course Code	Course Title	BOS	Credit Allocation				Total Credits
				L	T	P	S	
1	16EC71	Microwave & Radiating Systems	ECE	4	0	1	0	5
2	16EC72	Broadband Wireless –LTE 4G	ECE	4	0	0	0	4
3	16EC73	Mini Project**	ECE	0	0	3	0	3
4	16EC7FX	Elective F (PE)	ECE	4	0	0	0	4
5	16EC7GX	Elective G(PE)	ECE	4	0	0	0	4
6	16G7HXX	Elective H (OE)*	Respective BOS	3	0	0	0	3
		Total No. of Credits						23
		No. Of Hrs.		19	0	8	0	27

** EI, EE, CV, EC, ME – 6 hrs. / week Minor Project. *Students should take other department Global Elective courses

Elective F(PE)	Elective Title	Elective G(PE)	Elective Title	Elective 3 (OE) 16G7HXX
16EC7F1	Satellite Communications & GPS	16EC7G1	Radar & Navigation	To be opted from electives offered by other Departments. For more information about other electives see following table
16EC7F2	ARM Programming & Optimization	16EC7G2	Automotive Electronics	
16EC7F3	Speech Processing	16EC7G3	Multimedia Communication	
16EC7F4	Radio Frequency Integrated Circuits Design	16EC7G4	VLSI Testing for ICs	
16EC7F5	High Performance Computing	16EC7G5	High Speed digital design	
16EC7F6	Integrated Photonics	16EC7G6	MEMS and Smart Systems	
16EC7F7	Nanoelectronics			

PE - PROFESSIONAL ELECTIVE	OE- OTHER ELECTIVES
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Global Electives offered

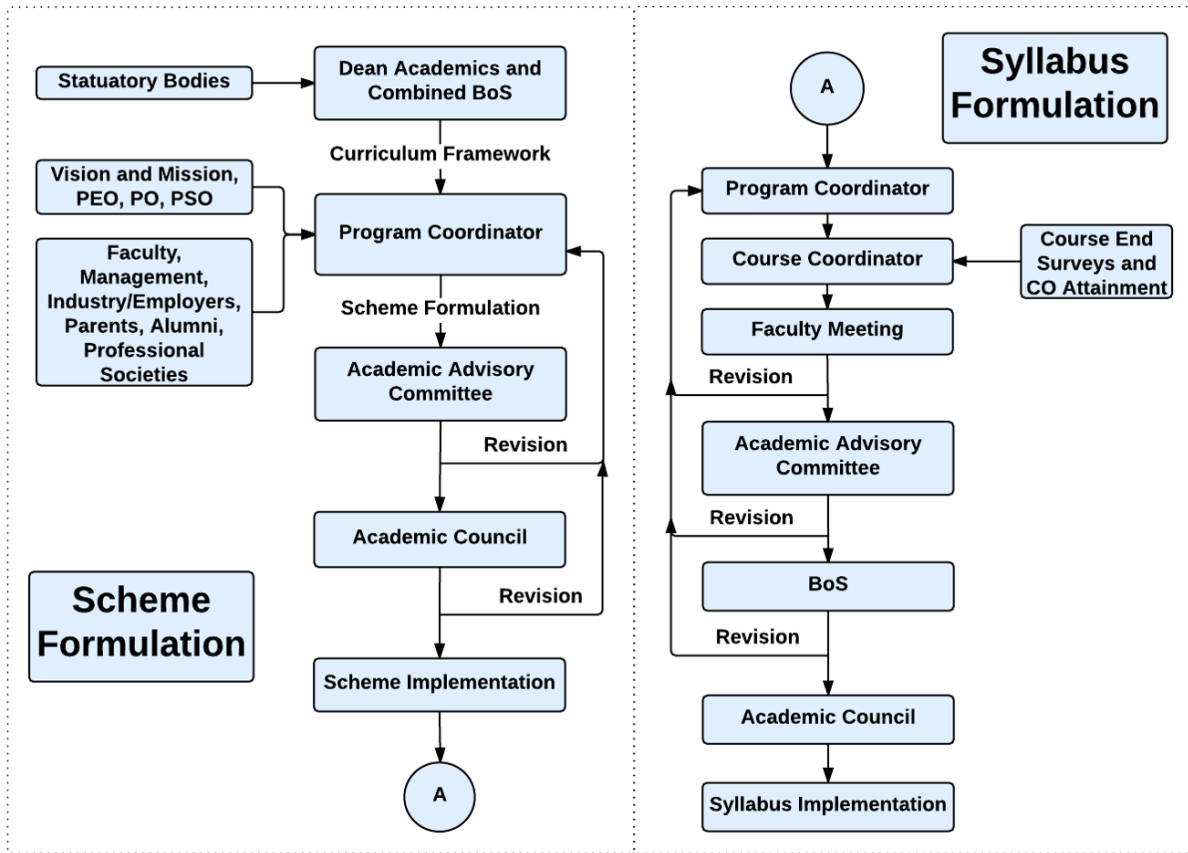
VII SEMESTER

S.No	Course	Course Code	Offering Dept.
1.	Nanotechnology	16G7H01	Biotechnology
2.	Industrial Safety and Risk Management	16G7H02	Chemical Engineering
3.	Intelligent Transportation Systems	16G7H03	Civil Engineering
4.	Intelligent Systems	16G7H04	Computer Science Engineering
5.	Image Processing & Machine Learning	16G7H05	Electronics & Communication Engineering
6.	Design Of Renewable Energy Systems	16G7H06	Electrical & Electronics Engineering
7.	Systems Engineering	16G7H07	Industrial & Management Engineering
8.	MEMS and Applications	16G7H08	Electronics & Instrumentation Engineering
9.	Introduction to Internet of Things	16G7H09	Information Science Engineering
10.	Industry 4.0 – Smart Manufacturing For The Future	16G7H10	Mechanical Engineering
11.	Space Technology And Applications	16G7H11	Telecommunication Engineering

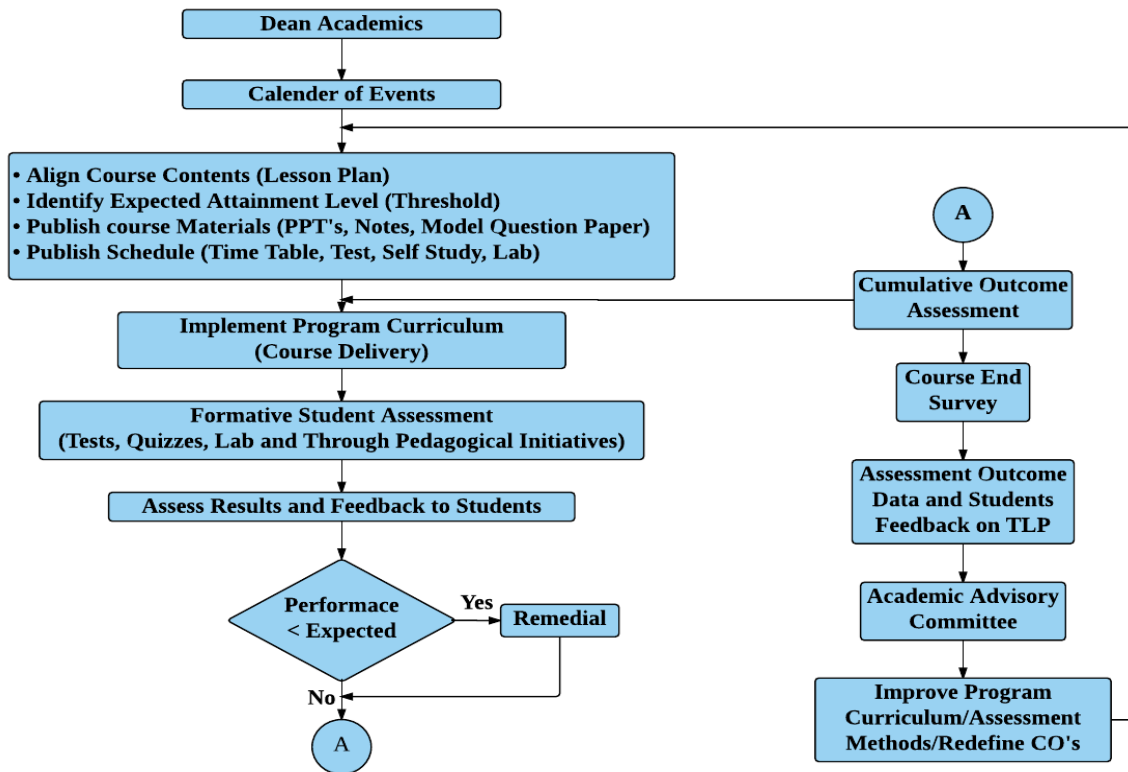
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EIGHTH SEMESTER								
Sl. No.	Course Code	Course Title	BOS	Credit Allocation				Total Credits
				L	T	P	S	
1	16ECP81	Major Project	ECE	0	0	16	0	16
2	16ECS82	Technical Seminar	ECE	0	0	2	0	2
3	16HSS83	Innovation and Social Skills	HSS	0	0	2	0	2
		Total No. of Credits						20
		No. Of Hrs.		0	0	40	0	40

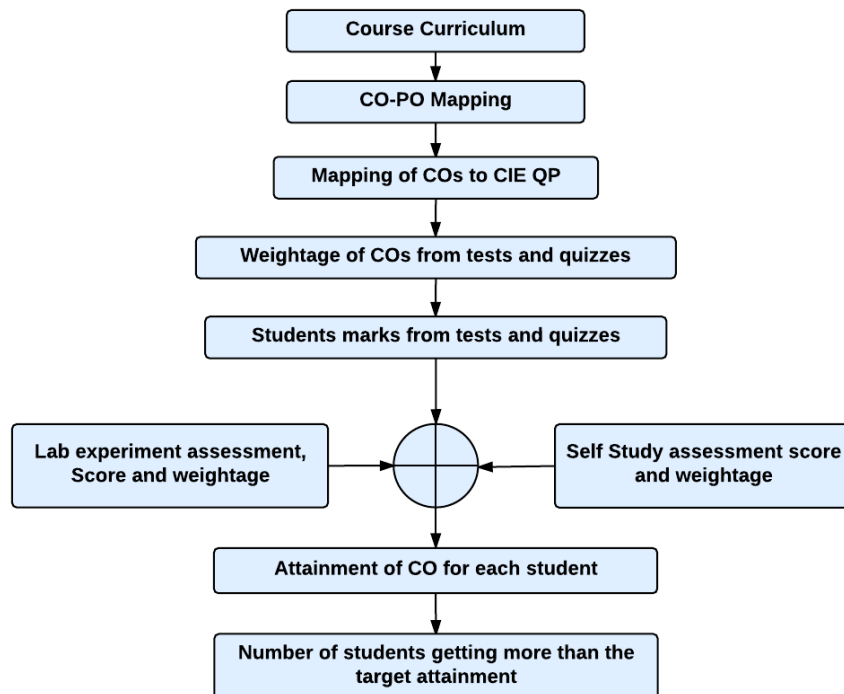
Curriculum Design Process



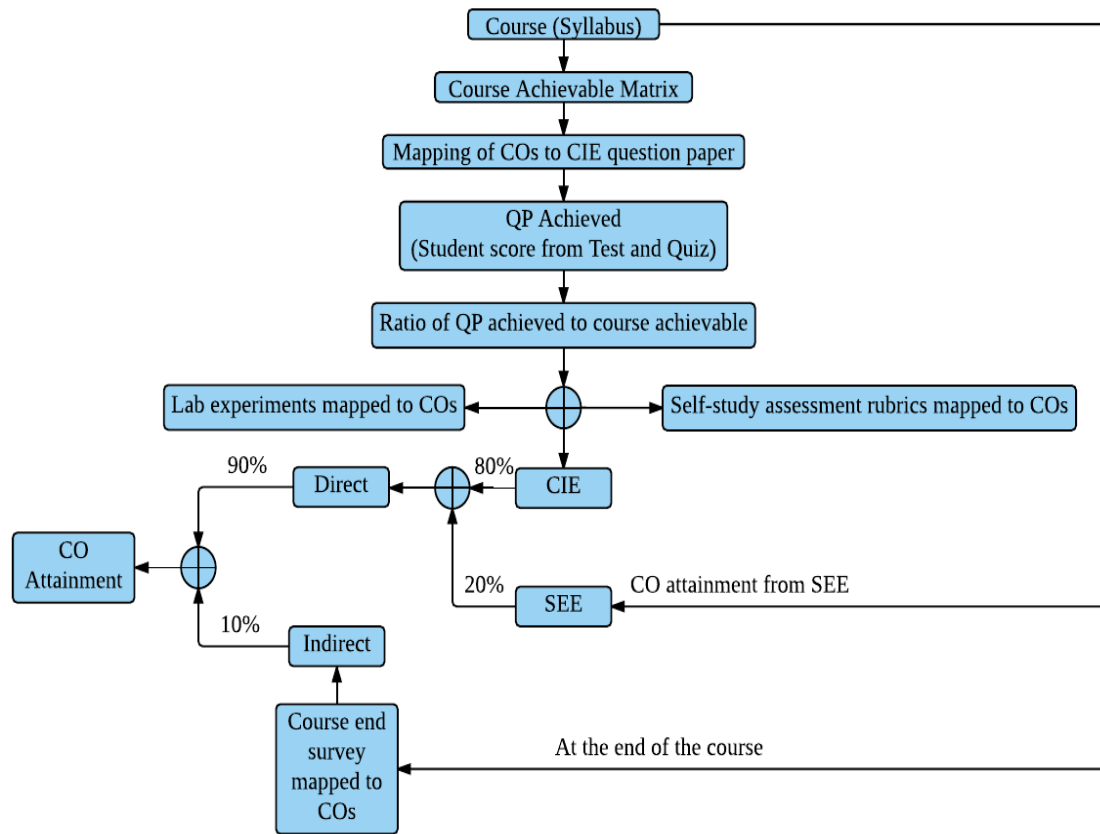
Academic Planning and Implementation



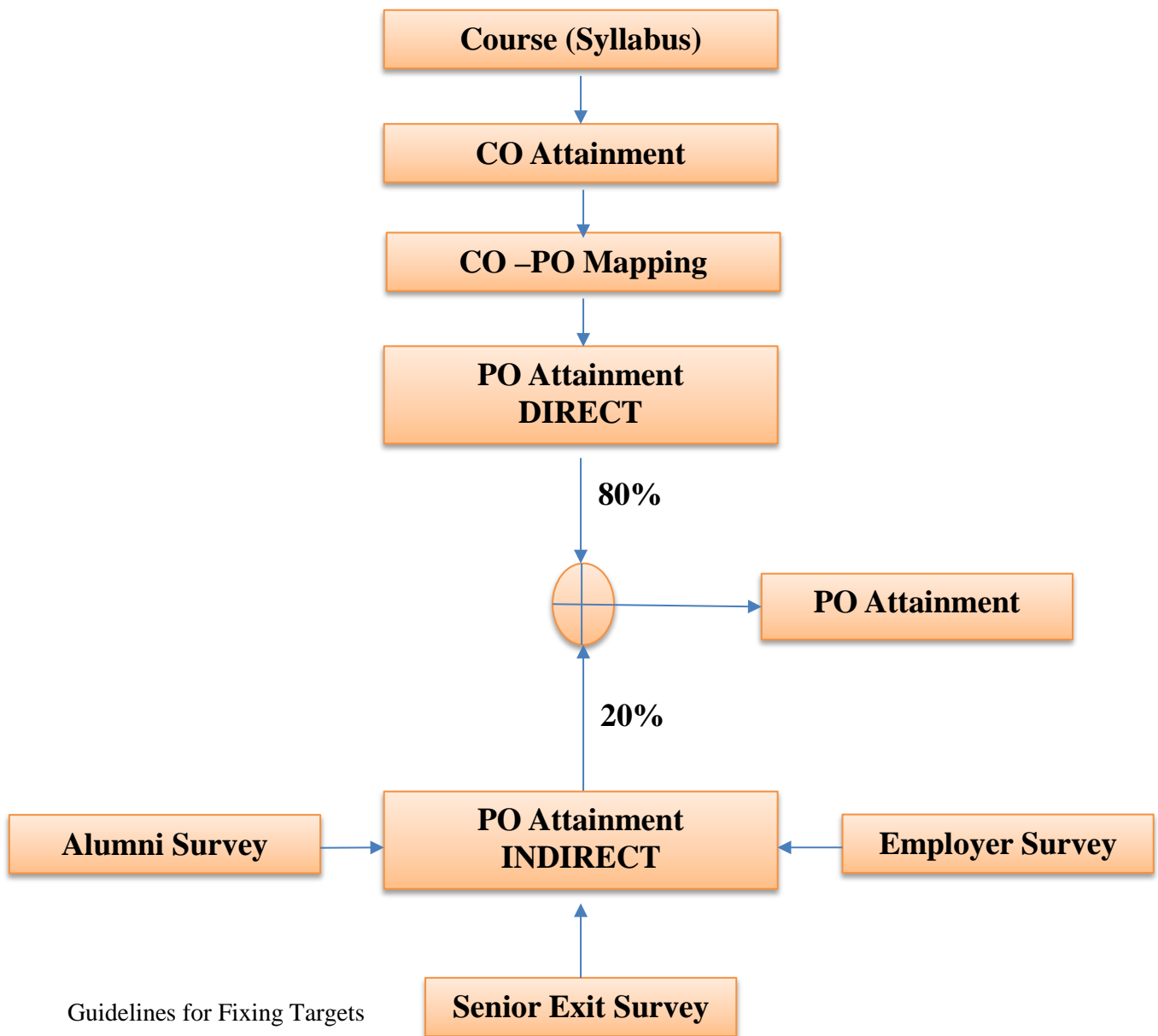
PROCESS FOR COURSE OUTCOME ATTAINMENT



Final CO Attainment Process



Program Outcome Attainment Process



Guidelines for Fixing Targets

- The target may be fixed based on last 3 years' average attainment

Credits Distribution as per UGC/VTU

Sl. No.	Category	Percentage (%)	Minimum No. of credits	2016 scheme	
				Without Mini Project	With Mini Project
1	Humanities	5-10	10	9+2	9+2
2	Basic Science	15-20	30	30	30
3	Engineering Science	15-20	30	30	30
4	Professional Core Courses (PC)	30-40	60	78+3=81 (3 credits core in place of Minor project in 7 th semester)	81-3=78 (3 Credits for minor project in 7 th semester)
5	Professional Elective Courses	10-15	20	20	20
6	Other Electives	5-10	10	10	10
7	Project Work	10-15	20	16+2 Major project +Tech. Seminar	16+2+3 Major project +Tech. Seminar +Mini Project
				200	200

Sl.No.	Category	Percentage (%)	Minimum No. Of credits	Assigned No. Of credits 2012	Proposed 2016 scheme	
					Without Mini Project	With Mini Project
1	Humanities	5-10	10	10	9+2	9+2
2	Basic Science	15-20	30	28	30	30
3	Engineering Science	15-20	30	28	30	30
4	Professional Core Courses(PC)	30-40	60	80	78+3=81 (3 credits core in place of Mini project in 7 th sem)	81-3=78 (3 Credits for mini project in 7 th sem)
5	Professional Elective Courses	10-15	20	20	20	20
6	Other Electives	5-10	10	11	10	10
7	Project Work	10-15	20	23 + 2	16+2 Major project +Tech. Seminar	16+2+3 Major project +Tech. Seminar +Mini Project
Total No. of Credits					200	200

SEMESTER WISE CREDIT DISTRIBUTION (SELF STUDY CREDIT INCLUDED EXCEPT FOR VII SEM)								
I	II	III	IV	V	VI	VII	VIII	TOTAL
25 (P)/25(C)	25/25	25	25	29	28	23	20	200

PROFESSIONAL CORE COURSE(PC)	PROFESSIONAL ELECTIVE COURSES(PES)	OTHER ELECTIVES(OE)
Common syllabus to be set jointly for such core Courses offered by two or more departments (Mandatory requirement)	Branch specific latest/Advanced Courses.	Include Courses which can be offered by various departments as group/global elective to other departments.