VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
B.E. in Electronics Engineering (VLSI Design and Technology)
Scheme of Teaching and Examinations 2022
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2023-24)

V SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	HSMS	BEC501	Technological Innovation and Management Entrepreneurship	TD- ECE/VDT PSB- ECE/VDT	3	0	0		03	50	50	100	3
2	IPCC	BVL502	Digital Signal Processing	TD- ECE/VDT PSB- ECE/VDT	3	0	2		03	50	50	100	4
3	PCC	BVL503	Digital VLSI Design	TD- ECE/VDT PSB- ECE/VDT	4	0	0		03	50	50	100	4
4	PCCL	BVLL504	Digital VLSI Design Lab	TD- ECE/VDT PSB- ECE/VDT	0	0	2		03	50	50	100	1
5	PEC	BEC515x	Professional Elective Course	TD- ECE/VDT PSB- ECE/VDT	3	0	0		03	50	50	100	3
6	PROJ	BVL586	Mini Project	TD- ECE/VDT PSB- ECE/VDT	0	0	4		03	100		100	2
7	AEC	BRMK557	**Research Methodology and IPR**		2	2	0		02	50	50	100	3
8	MC	BESK508	Environmental Studies	Any Department	2	0	0		02	50	50	100	2
9	MC	BNSK559	National Service Scheme (NSS)	NSS coordinator	0	0	2			100		100	0
		BPEK559	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		BYOK559	Yoga	Yoga Teacher									
								Total		550	350	900	22

	Professional Elective Course			
BEC515A	**Intelligent Systems and Machine Learning Algorithms**		BEC515C	Data Structure using C++
BEC515B	Digital Switching and Finite Automata Theory		BVL515D	VLSI Fabrication Technology

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SXX**:

Semester End Evaluation. **K :** The letter in the course code indicates common to al the stream of engineering. **PROJ**: Project /Mini Project. **PEC**: Professional Elective Course

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Mini-project work: Mini Project is a laboratory-oriented/hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students.

CIE procedure for Mini-project:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batches mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

No SEE component for Mini-Project.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering.   Each group will provide an option to select one course. The minimum number of students' strengths for offering a professional elective is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

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(Effective from the academic year 2023-24)

VI SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	BEC601	Embedded System Design	TD- ECE/VDT PSB- ECE/VDT	3	0	2		03	50	50	100	4
2	PCC	BVL602	Analog and Mixed Signal Integrated Circuit Design	TD- ECE/VDT PSB- ECE/VDT	4	0	0		03	50	50	100	4
3	PEC	BEC613x	Professional Elective Course	TD- ECE/VDT PSB- ECE/VDT	3	0	0		03	50	50	100	3
4	OEC	BEC654x	Open Elective Course	TD- ECE/VDT PSB- ECE/VDT	3	0	0		03	50	50	100	3
5	PROJ	BVL685	Major Project Phase I	TD- ECE/VDT PSB-ECE/VDT	0	0	4		03	100	--	100	2
6	PCCL	BVLL606	Analog and Mixed Signal IC Design Lab	TD- ECE/VDT PSB- ECE/VDT	0	0	2		03	50	50	100	1
7	AEC/SDC	BEC657x	Ability Enhancement Course/Skill Development Course V	TD- ECE/VDT PSB- ECE/VDT	If the course is offered as a Theory				01	50	50	100	1
					1	0	0						
					If course is offered as a practical								
					0	0	2						
8	MC	BNSK658	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		BPEK658	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		BYOK658	Yoga	Yoga Teacher									
9	IKS	BIKS609	Indian Knowledge System		1	0	0		01	100	---	100	0
								Total		**600**	**300**	**900**	**18**

Professional Elective Course			
BVL613A	Low Power VLSI Design	BEC613C	Digital Image Processing

BEC613B	Computer and Data Security	BVL613D	Semiconductor Packaging and Testing
Open Elective Course			
BEC654A	Digital System Design using Verilog	BVL654C	PCB Design and Fabrication
BEC654B	Consumer Electronics	BEC654D	Basic VLSI Design
Ability Enhancement Course / Skill Enhancement Course-V			
BVL657A	Static Timing Analysis Lab	BEC657C	IOT Lab
BEC657B	System Modelling using Simulink	BEC657D	Python Programming for Machine Learning Applications

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **K :** The letter in the course code indicates common to al the stream of engineering. **PROJ**: Project /Mini Project. **PEC**: Professional Elective Course. **PROJ**: Project Phase -I, **OEC**: Open Elective Course

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course ismandatory for the award of degree.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering.   Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses:

Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum number of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

Project Phase-I : Students have to discuss with the mentor /guide and with their helphe/she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

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SCHEME-A- VII SEMESTER (Swappable VII and VIII SEMESTER)

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination					Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks		
					L	T	P	S						
1	IPCC	BVL701	Verification using System Verilog	TD- ECE/VDT PSB- ECE/VDT	3	0	2		03	50	50	100		4
2	IPCC	BVL702	Design for Testability	TD- ECE/VDT PSB- ECE/VDT	3	0	2		03	50	50	100		4
3	PCC	BVL703	CAD for VLSI	TD- ECE/VDT PSB- ECE/VDT	4	0	0		03	50	50	100		4
4	PEC	BEC714x	**Professional Elective Course**	TD- ECE/VDT PSB- ECE/VDT	3	0	0		03	50	50	100		3
5	OEC	BEC755x	**Open Elective Course**	TD- ECE/VDT PSB- ECE/VDT	3	0	0		01	50	50	100		3
6	PROJ	BEC786	**Major Project Phase-II**	TD- ECE/VDT PSB- ECE/VDT	0	0	12		03	100	100	200		6
										350	350	700		24

Professional Elective Course				
BEC714A	Application-Specific Integrated Circuit		BVL714C	Machine Learning for VLSI
BEC714B	Cyber Security		BVL714D	Microfabrication and Mems
Open Elective Course				
BEC755A	E-waste Management		BEC755C	Embedded System Applications
BVL755B	Industrial Safety for Semiconductor Industry		BVL755D	Introduction to MATLAB Programming

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **PEC**: Professional Elective Course, **OEC**: Open Elective Course PR: Project Work, **L:** Lecture, **T:** Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **TD-** Teaching Department, **PSB**: Paper Setting department, **OEC**: Open Elective Course, **PEC**: Professional Elective Course. **PROJ**: Project work

Note: VII and VIII semesters of IV years of the program

(1) Institutions can swap the VII and VIII Semester Schemes of Teaching and Examinations to accommodate research internships/ industry internships after the VI semester**.**

(2) Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether the VII or VIII semesters is completed during the beginning of the IV year or the later part of IV years of the program.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering.   Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses:

Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

PROJECT WORK (21XXP75): The objective of the Project work is

   (i) To encourage independent learning and the innovative attitude of the students.

   (ii) To develop interactive attitude, communication skills, organization, time management, and presentation skills.

   (iii) To impart flexibility and adaptability.

   (iv) To inspire team working.

   (v) To expand intellectual capacity, credibility, judgment and intuition.

   (vi) To adhere to punctuality, setting and meeting deadlines.

   (vii) To install responsibilities to oneself and others.

   (viii) To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

CIE procedure for Project Work:

(1) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work, shall be based on the evaluation of the project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

(2) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

SEE procedure for Project Work: SEE for project work will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25.

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SCHEME - A- VIII SEMESTER (Swappable VII and VIII SEMESTER)

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PEC	BVL801x	**Professional Elective (Online Courses)**		3	0	0		03	50	50	100	3
2	OEC	BVL802x	**Open Elective (Online Courses)**		3	0	0		01	50	50	100	3
3	INT	BVL803	**Internship (Industry/Research) (14 - 20 weeks)**		0	0	12		03	100	100	200	10
										200	**200**	**400**	**16**

Professional Elective Course (Online courses)			
BVL801A	BOS Recommended Course	BVL801C	BOS Recommended Course
BVL801B	BOS Recommended Course	BVL801D	BOS Recommended Course

Open Elective Courses (Online Courses)			
BVL802A	BOS Recommended Course	BVL802C	BOS Recommended Course
BVL802B	BOS Recommended Course	BVL802D	BOS Recommended Course

L: Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **TD-** Teaching Department, **PSB**: Paper Setting department, **OEC**: Open Elective Course, **PEC**: Professional Elective Course. **PROJ**: Project work, **INT**: Industry Internship / Research Internship / Rural Internship

Note: VII and VIII semesters of IV years of the program

Swapping Facility

- Institutions can swap VII and VIII Semester Scheme of Teaching and Examinations to accommodate **research internships/ industry internships/Rural Internship** after the VI semester**.**

- Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether VII or VIII semester is completed during the beginning of IV year or later part of IV year of the program.

Elucidation:

At the beginning of IV years of the program i.e., after VI semester, VII semester classwork and VIII semester **Research Internship /Industrial Internship / Rural Internship** shall be permitted to be operated simultaneously by the University so that students have ample opportunity for an internship. In other words, a good percentage of the class shall attend VII semester classwork and a similar percentage of others shall attend to Research Internship or Industrial Internship or Rural Internship.

Research/Industrial /Rural Internship shall be carried out at an Industry, NGO, MSME, Innovation center, Incubation center, Start-up, the centre of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes.

The mandatory Research internship /Industry internship / Rural Internships for 14 to 20 weeks. The internship shall be considered as a head of passing and shall be considered for the award of a degree. Those, who do not take up/complete the internship shall be declared to fail and shall have to complete it during the subsequent University examination after satisfying the internship requirements.

Research internship: A research internship is intended to offer the flavor of current research going on in the research field. It helps students get familiarized with the field and imparts the skill required for carrying out research.

Industry internship: Is an extended period of work experience undertaken by students to supplement their degree for professional development. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with contingencies helps students recognize, appreciate, and adapt to organizational realities by tempering their knowledge with practical constraints.

Rural Internship: Rural development internship is an initiative of Unnat Bharat Abhiyan Cell, RGIT in association with AICTE to involve students of all departments studying in different academic years for exploring various opportunities in techno-social fields, to connect and work with Rural India for their upliftment.

The faculty coordinator or mentor has to monitor the student's internship progress and interact with them to guide for the successful completion of the internship.

The students are permitted to carry out the internship anywhere in India or abroad. University shall not bear any expenses incurred in respect of the internship.

With the consent of the internal guide and Principal of the Institution, students shall be allowed to carry out the internship at their hometown (**within or outside the state or abroad**), provided favorable facilities are available for the internship and the student remains regularly in contact with the internal guide. **University shall not bear any cost involved in carrying out the internship by students.** However, students can receive any financial assistance extended by the organization.

Professional Elective /Open Elective Course: These are ONLINE courses suggested by the respective Board of Studies. Details of these courses shall be made available for students on the VTU web portal.

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SCHEME-B-VI SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination					Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	BXX601	Embedded System Design		3	0	2		03	50	50	100	4
2	PCC	BXX602	Microwave and Antenna Theory		4	0	0		03	50	50	100	4
3	PEC	BXX613x	Professional Elective Course		3	0	0		03	50	50	100	3
4	OEC	BXX654x	Open Elective Course		3	0	0		03	50	50	100	3
5	PCCL	BXXL606	Lab component		0	0	2		03	50	50	100	1
6	AEC/SDC	BXX657x	Ability Enhancement Course/Skill Development Course V		If the course is offered as a Theory				01	50	50	100	1
					1	0	0						
					If course is offered as a practical								
					0	0	2						
7	MC	BNSK658	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		BPEK658	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		BYOK658	Yoga	Yoga Teacher									
8	IKS	BIKS609	Indian Knowledge System		1	0	0		01	100	---	100	0
								Total		**500**	**300**	**800**	**16**

Professional Elective Course			
BEC613A	Intelligent Systems and Machine Learning Algorithms	BEC613C	Digital Image Processing
BEC613B	Computer and Data Security	BEC613D	FPGA System Design using Verilog
Open Elective Course			
BEC654A	Digital System Design using Verilog	BEC654C	Electronic Communication Systems

BEC654B	Consumer Electronics	BEC654D	Basic VLSI Design
Ability Enhancement Course / Skill Enhancement Course-V			
BEC657A	FPGA System Design using Verilog LAB	BEC657C	IOT Lab
BEC657B	System Modelling using Simulink	BEC657D	Python Programming for Machine Learning Applications

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SCHEME-B-   VII and VIII semester for who seeks internship with project work

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination					Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks		
					L	T	P	S						
1	PCC	BXX701	To be completed in 5th / 6th semester		3	0	2		03	50	50	100		4
2	PCC	BXX702	To be completed in 5th / 6th semester		3	0	2		03	50	50	100		4
3	PCC	BXX703	To be completed in 5th / 6th semester		4	0	0		03	50	50	100		3
4	PEC	BXX714x	Professional Elective Course (MOOC Courses)		3	0	0		03	50	50	100		3
5	OEC	BXX755x	Open Elective Courses(MOOC courses)		3	0	0		01	50	50	100		3
1	PEC	Bxx801x	Professional Elective (Online Courses)		3	0	0		03	50	50	100		3
2	OEC	Bxx802x	Open Elective (Online Courses)		3	0	0		01	50	50	100		3
3	PROJ	BXX883	Project Work Outcome of Training		0	0	12		03	100	100	200		9
4	INT	Bxx804	Internship (Industry/Research) (Two semesters)		0	0	12		03	100	100	200		10
									Total	**200**	**200**	**400**		**42**