

Visvesvaraya Technological University, Belagavi B.E in Biomedical Engineering Scheme of Teaching and Examinations – 2022 Outcome Based Education (OBE) and Choice Based Credit System (CBCS) [Effective from the academic year 2022-2023]														
V SEMESTER														
Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week					Examination				Credits
					Theory	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks		
					L	T	P	S						
1	HSMS	BBM501	Technological Innovation Management & Entrepreneurship	TD: BM PSB – EI/BM/ML	3	0	0		03	50	50	100	3	
2	IPCC	BBM502	Digital Signal Processing	TD: BM PSB –EI/BM/ML	3	0	2		03	50	50	100	4	
3	PCC	BBM503	Clinical Instrumentation	TD: BM PSB EI/BM/ML	4	0	0		03	50	50	100	4	
4	PCCL	BBM504	Clinical Instrumentation Lab	TD: BM PSB EI/BM/ML	0	0	2		03	50	50	100	1	
5	PEC	BBM515x	Professional Elective Course	TD: BM PSB EI/BM/ML	3	0	0		03	50	50	100	3	
6	PROJ	BBM586	Mini Project	TD: BM PSB EI	0	0	4		03	100	-	100	2	
7	AEC	BRMK557	Research Methodology and IPR	TD: BM PSB EI/BM/ML	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										
		BPEK559	Physical Education (PE) (Sports and Athletics)	Physical Education Director	0	0	2		03	100	-	100	0	
		BYOK559	Yoga	Yoga Teacher										
Professional Elective Course														
BBM515A	Biomedical Signal Processing			BBM515C	Biomedical Equipments									
BBM515B	Raspberry Pi			BBM515D	Computer Communication Networks									
Total										500	300	800	22	

<p>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</p> <p>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 the 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 a degree.</p> <p>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.</p> <p>CIE procedure for Mini-project:</p> <p>(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.</p> <p>(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.</p> <p>No SEE component for Mini-Project.</p>
<p>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.</p>

Visvesvaraya Technological University, Belagavi B.E in Biomedical Engineering Scheme of Teaching and Examinations – 2022 Outcome Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2022-2023)															
VI SEMESTER															
Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits		
					Theory	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks			
					L	T	P								
1	IPCC	BBM601	Medical Image Processing	TD- EI PSB: EI/BM/ML	3	0	2		03	50	50	100	4		
2	PCC	BBM602	Biomedical Digital Signal Processing	TD- EI PSB: EI/BM/ML	4	0	0		03	50	50	100	4		
3	PEC	BBM613x	Professional Elective Course	TD: BM PSB: EI/BM/ML	3	0	0		03	50	50	100	3		
4	OEC	BBM654x	Open Elective Course	Offered Department	3	0	0		03	50	50	100	3		
5	PROJ	BBM685	Project Phase I	TD: BM PSB: BM	0	0	4		03	100	-	100	2		
6	PCCL	BBM1606	Biomedical DSP Lab	TD: BM PSB: EI/BM/ML	0	0	2		03	50	50	100	1		
7	AEC/SDC	BEI657	Ability Enhancement Course/Skill Development Course V	TD: BM PSB: EI/BM/ML	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						100	-	100	0		
					Physical Education (PE) (Sports and Athletics)										
					Yoga										
9	IKS	BIKS609	Indian Knowledge System	Yoga Teacher	1	0	0		01	100	0	100	0		
										Total	500	300	800	18	

Professional Elective Course		
BBM613A	Hospital Design, Planning and Management	BBM613C Medical Imaging Techniques
BBM613B	Scientific & Analytical Instrumentation	BBM613D Biochemical Analysis and Techniques
Open Elective Course		
BBM654A	Biomedical Transducers and Medical Instrumentation	BBM654C Rehabilitation Engineering and Assistive Technology
BBM654B	Fundamentals of Medical Imaging Techniques	BBM654D Virtual Bio-Instrumentation
Ability Enhancement Course / Skill Development Course V		
BBM657A	Medical Device Development	BBM657C Optical Instrumentation
BBM657B	Sensor and Medical IoT	BBM657D Brain Computer Interface
<p>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 all the streams of engineering. PROJ: Project /Mini Project. PEC: Professional Elective Course. PROJ: Project Phase -I, OEC: Open Elective Course</p> <p>Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical's 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</p> <p>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.</p> <p>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</p>		

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

<p style="text-align: center;">Visvesvaraya Technological University, Belagavi B.E in Biomedical Engineering Scheme of Teaching and Examinations - 2022 Outcome Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2022-2023)</p>													
VII SEMESTER (Swappable VII and VIII SEMESTER)													
Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Duration in hours	Examination			Credits
					Theory	Tutorial	Practical/ Drawing	Self-Study		CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	BBM701	Biomechanics and Biodynamics	TD: BM PSB - EI/BM/ML	3	0	2		03	50	50	100	4
2	IPCC	BBM702	ARM Processor	TD: BM PSB - EI/BM/ML	3	0	2		03	50	50	100	4
3	PCC	BBM703	Biomaterials and artificial organs	TD: BM PSB - EI/BM/ML	4	0	0		03	50	50	100	4
4	PEC	BBM714x	Professional Elective Course	TD: BM PSB - EI/BM/ML	3	0	0		03	50	50	100	3
5	OEC	BBM755x	Open Elective Course	TD: BM PSB - EI/BM/ML	3	0	0		01	50	50	100	3
6	PROJ	BBM786	Major Project Phase-II	TD: BM PSB BM	0	0	12		03	100	100	200	6
									Total	400	300	700	24
Professional Elective Course													
BBM714A		Biostatistics		BBM714C								Physiological System Modelling	
BBM714B		Medical Informatics and Expert Systems		BBM714D								Advanced Clinical Instrumentation	
Open Elective Course													
BBM755A		Neural Network and Fuzzy Logic Systems		BBM755C								Sensors and Measurement s	
BBM755B		Medical Informatics		BBM755D								Biomedical Image Processing	

<p>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, DEC: Open Elective Course, PEC: Professional Elective Course. PROJ: Project work</p>
<p>Note: VII and VIII semesters of IV years of the program</p> <p>(1) Institutions can swap the VII and VIII Semester Schemes of Teaching and Examinations to accommodate research internships/ industry internships after the VI semester.</p> <p>(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.</p>
<p>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.</p>
<p>Open Elective Courses:</p> <p>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.</p>
<p>PROJECT WORK (21XXPT75): The objective of the Project work is</p> <ul style="list-style-type: none"> (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 discussions to present and exchange ideas.
<p>CIE procedure for Project Work:</p> <p>(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</p>

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.

Visvesvaraya Technological University, Belagavi
B.E in Biomedical Engineering

Scheme of Teaching and Examinations - 2022

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
 [Effective from the academic year 2022-2023]

VIII SEMESTER (Swappable VII and VIII Semester)

Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting (PSB)	Teaching Hours /Week					Examination				Credits
					Theory	Tutorial	Practical/ Drawing	Self-Study		CIE Marks	SEE Marks	Total Marks		
								L	T				P	
1	PEC	BBM801x	Professional Elective (Online Courses)	TD: BM PSB- E/ BM/ML	3	0	0	03	50	50	100	3		
2	OEC	BBM802x	Open Elective (Online Courses)	TD: BM PSB- E/ BM/ML	3	0	0	01	50	50	100	3		
3	INT	BBM803	Internship (Industry/Research) (14 - 20 weeks)	TD: BM PSB EI	0	0	12	03	100	100	200	10		
					Total				200	200	400	16		

Professional Elective Course (Online courses)

BBM801A	Artificial Intelligence and Machine Learning	BBM801C	Telemedicine
BBM801B	Ergonomics	BBM801D	Bio-MEMS
Open Elective Courses (Online Courses)			
BBM802A	Database Management System in Healthcare	BBM802C	Sensor Technology
BBM802B	Hospital Management	BBM802D	Medical Optics

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 Centre, Incubation Centre, Start-up, the Center of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes.

The mandatory Research internship /Industry internship / Rural Internship is 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 flavour 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 them 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 in their hometown (**within or outside the state or abroad**), provided favourable 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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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
B.E. in the title of the program
Scheme of Teaching and Examinations2022
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2023-24)

Scheme B -VI SEMESTER for the candidates who seek a two-semester internship with project work /Start-up

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	BBM601	Medical Image Processing		3	0	2		03	50	50	100	4
2	PCC	BBM602	Biomedical Digital Image Processing		4	0	0		03	50	50	100	4
3	PEC	BBM613x	Professional Elective Course		3	0	0		03	50	50	100	3
4	OEC	BBM654x	Open Elective Course		3	0	0		03	50	50	100	3
5	PCCL	BBML606	Biomedical DSP Lab		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									
		BPEK658	Physical Education (PE) (Sports and Athletics)	Physical Education Director	0	0	2			100	---	100	0
		BYOK658	Yoga	Yoga Teacher									
8	IKS	BIKS609	Indian Knowledge System		1	0	0		01	100	0	100	0
Total									500	300	800	16	

Professional Elective Course			
BBM613A	Hospital Design, Planning and Management	BBM613C	Medical Imaging Techniques
BBM613B	Scientific & Analytical Instrumentation	BBM613D	Biochemical Analysis and Techniques
Open Elective Course			
BBM654A	Biomedical Transducers and Medical Instrumentation	BBM654C	Rehabilitation Engineering and Assistive Technology
BBM654B	Fundamentals of Medical Imaging Techniques	BBM654D	Virtual Bio-Instrumentation
Ability Enhancement Course / Skill Development Course V			
BBM657A	Medical Device Development	BBM657C	Optical Instrumentation
BBM657B	Sensor and Medical IoT	BBM657D	Brain Computer Interface

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
B.E. in the title of the program
Scheme of Teaching and Examinations2022
 Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
 (Effective from the academic year 2023-24)

Scheme BVII and VIII semesters for the candidates who seek an internship with project work

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question and 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	BBM701	To be completed in 5 th /6 th semester		3	0	2		03	50	50	100	4
2	IPCC	BBM702	To be completed in 5 th /6 th semester		3	0	2		03	50	50	100	4
3	PCC	BBM703	To be completed in the 5 th / 6 th semester		4	0	0		03	50	50	100	3
4	PEC	BBM714x	Professional Elective Course (MOOC Courses)		3	0	0		03	50	50	100	3
5	OEC	BBM755x	Open Elective Courses (MOOC courses)		3	0	0		01	50	50	100	3
1	PEC	BBM801x	Professional Elective (MOOC Courses)		3	0	0		03	50	50	100	3
2	OEC	BBM802x	Open Elective (MOOC Courses)		3	0	0		01	50	50	100	3
3	PROJ	BBM883	Project - outcome of training		0	0	12		03	100	100	200	9
4	INT	BBM804	Internship (Industry/Research) (02 semesters)		0	0	12		03	100	100	200	10
										200	200	400	42