



# ALVA'S INSTITUTE OF ENGINEERING AND TECHNOLOGY

A Unit of Alva's Education Foundation (R)

( Affiliated to Visvesvaraya Technological University, Belagavi

Approved by AICTE, New Delhi & Recognised by Government of Karnataka )

Shobhavana Campus, Mirar, Moodbidri - 574 225, Mangalore, D.K., Karnataka State

Phone : 08258-262724 (O), 262725 (P), Teletax 08258-262726

Email : principalaiet08@gmail.com, Web www.aiet.org.in

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Date: 12/08/2019

To,

**The Chairman,**  
Board of Studies (BoS)  
Mechanical Engineering  
VTU, Belagavi

**Sub:** Proposed suggestions for Proposed Syllabus 2018- Scheme of VTU Syllabus- reg

With reference to the above cited subject, we have hereby enclosed a list of curricular gaps and the proposed suggestions for some courses in of proposed 2018 Scheme/Syllabus of Mechanical Engineering board of Visvesvaraya Technological University, Belagavi.

We highly recommend you the following changes in the list and request you to consider those during the revision of the curriculum and syllabus by the university.

Thanking you

  
**Head of the Department**  
**Mechanical Engineering**  
**H.O.D.**

Dept. Of Mechanical Engineering  
Alva's Institute of Engg. & Technology  
Mirar, MOODBIDRI - 574 225

  
**Principal**

**AIET, Moodbidri**  
**PRINCIPAL**

**Alva's Institute of Engg & Technology,**  
**Mirar, MOODBIDRI - 574 225, D.K**

### **Curricular Gaps and Proposed Suggestions**

1. In 2018-19 scheme, Refrigeration and Air Conditioning (18ME642), & Automation and Robotics (18ME732) is offered as professional elective course. Since these subjects are required for all the students for innovative projects and Placements. We suggest the board to consider it as Core Course during the revision of syllabus & scheme.
2. In the present scenario, world is moving toward the Hybrid Electric vehicles. We suggest BOS team to include Hybrid Eclectic vehicle course as per the current trends of the industry requirements during the revision
3. As per the current scenario, Piping design and engineering, Supply chain management and Nano technology subjects are required for the students. Hence we suggest BOS team member to add above subject as professional elective courses during the revision.
4. In Computer Aided Design and Manufacturing (18ME72), we suggest BOS members to add content on programming advanced CNC multi-axis machines, setting of tools, machine limits, capabilities, and safety.

## MECHANICAL ENGINEERING

### Skillsets targeted

Multi and interdisciplinary approaches:

1. Design, develop and manufacturing of new or modified components for mechanical systems using **computer-aided design/modelling software/additive manufacturing**
2. Latest industrial pursuits, particularly in the areas of **automation, robotics, and smart scientific computing**,
3. Development of **smart manufacturing** capabilities for relevant industries
4. To play key roles in improving the range and performance of **hybrid and electric automotive vehicles**
5. Design of power-producing machines in the fields **of alternative energies** and usage of Simulation tools
6. Concepts of Augmented Reality and Virtual Reality in realizing Mechanical Systems.

Visvesvaraya Technological University, Belagavi <b>B.E.in Mechanical Engineering</b> Scheme of Teaching and Examinations 2021 Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2021-22)													
<b>III SEMESTER</b>													
Sl.No	Course and Course Code		Course Title	Teaching Department	Teaching Hours / Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIEMarks	SEEMarks	Total Marks	
					L	T	P	S					
1	BSC	21MAT31	Mathematics Course (Common to all)	Maths	3	0	0		3	50	50	100	3
2	IPCC	21MAT32	Metal casting, Forming and Joining Processes	ME/IPE	3	0	2		3	50	50	100	4
3	IPCC	21ME33	Material Science and Engineering	ME/IPE	3	0	2		3	50	50	100	4
4	PCC	21ME34	Thermodynamics	ME	2	2	0		3	50	50	100	3
5	PCC L	21MEL35	Machine Drawing	ME	0	0	2		3	50	50	100	1
6	INT	21INT36	Summer Internship-I	Completed during the vacation of II and III semesters. Lateral entry students have to attend the internship during the vacation of III & IV semester ***						50	50	100	2
7	HSM C	21KSK37	Samskrutika Kannada		1	0	0		1	50	50	100	1
		21KBK37	Balake Kannada		1	0	0						
		Or											
		21CIP37	Constitution of India & Professional Ethics		1	0	0						
8	AEC	21ME38x	Ability Enhancement Course-III		1	0	0		1	50	50	100	1
9	UHV	21UH39	Social Connect And Responsibility		1	0	0		1	50	50	100	1
<b>Total</b>									<b>18</b>	<b>450</b>	<b>450</b>	<b>900</b>	<b>20</b>

<b>Note:</b> BSC:Basic Science Course, <b>PCC:</b> ProfessionalCore Course, <b>HSMC:</b> HumanityandSocialScience & Management Courses,, <b>AEC</b> –Ability Enhancement Courses. <b>INT</b> –Internship, <b>UHV-</b> Universal Human Value Courses, <b>IPCC:</b> Integrated Professional Core Course. <b>L</b> –Lecture, <b>T</b> –Tutorial, <b>P</b> –Practical/Drawing, <b>S</b> –SelfStudyComponent, <b>CIE:</b> ContinuousInternalEvaluation, <b>SEE:</b> SemesterEndExamination													
21KBK37 <b>BalakeKannada</b> isfor non-Kannadaspeaking,reading,andwritingstudents,and21KSK37 <b>Samskrutika Kannada</b> isfor studentswhospeak,readandwriteKannada.													
<b>The courseprescribedtolateralentryDiplomaholdersadmittedtoIIIsemesterofEngineeringprograms</b>													
<b>10</b>	<b>NCMC</b>	<b>21MATDIP31</b>	<b>AdditionalMathematics-I</b>	<b>Maths</b>	<b>02</b>	<b>02</b>	<b>--</b>			<b>100</b>	<b>---</b>	<b>100</b>	<b>0</b>
1. The mandatory non – credit courses <b>AdditionalMathematics I and II</b> prescribed for III and IV semesters respectively, to thelateral entry Diplomaholders admittedto III semester of BE/B.Tech., programs, shall attend the classes duringthe respective semesters to complete all the formalities ofthecourseandappearfortheContinuous Internal Evaluation (CIE).Incase,anystudentfailstoregisterforthesaidcourse/failstosecuretheminimum40%ofthe prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the requirements duringsubsequentsemester/s toappear forCIE.													
2. TheseCoursesshallnotbe consideredforverticalprogression,butcompletionofthecoursesshallbemandatoryfortheawardofdegree.													
<b>***21INT36: Lateral Entry students:</b> Allthestudentsadmitted to engineering programs under the lateral entry categoryshallhavetoundergoamandatory <b>21INT36summer Internship-I</b> of <b>03weeks</b> during the intervening vacation of III and IV semesters. Summer Internship shall include Inter / Intra Institutional activities.AUniversity Viva-voce examination shall be conducted during the IV semester examinations and the prescribed credit earned after successful completion of the course 21INT36 shall be included in the III semester grade card. The III semester grade card shall be issued only after completing all the courses of III semester. Theinternship shall be considered asaheadofpassingandshallbeconsideredfor vertical progression and fortheawardofdegree.Those, who do not take up / complete theinternshipshallbedeclaredfailandshallhavetocompleteduringsubsequentUniversityexaminationaftersatisfyingtheinternshiprequirements during subsequent semesters. (The faculty coordinator or mentor has to monitor the students’ internship progress and interact with guide them for the successful completion of the internship.)													
<b>Integrated Professional Core Course (IPCC):</b> refers to Professional Theory Core Course Integrated with Practical of the same course.Credit for IPCC can be 04 considering L:T:P as 3:0:2 or L:T:P as 2:2:2. The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by CIE only and there shall be no SEE. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (BE/B.Tech.,)2021-22 may be referred.													
<b>Summer Internship-I: SEE</b> shall be through seminar and viva-voce.													

<b>AbilityEnhancementCourses-III</b>	
21ME381	Introduction to PYTHON
21ME382	Fundamentals of Virtual Reality APP Development
21ME383	Spreadsheet for Engineers
21ME384	<i>Fundamentals of Sensors and Actuators</i>
21ME385	<i>Tools in Scientific Computing</i>

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IV SEMESTER													
Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours / Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	BSC	21ME41	Operations Research	ME/IPE	2	2	0	0	3	50	50	100	3
2	IPCC	21ME42	Machining Science and Jigs & Fixtures	ME/IPE	3	0	2	0	3	50	50	100	4
3	IPCC	21ME43	Fluid Mechanics	ME	3	0	2	0	3	50	50	100	4
4	PCC	21ME44	Mechanics of Materials	ME	2	2	0	0	3	50	50	100	3
5	AEC	21BE45	Biology For Engineers	BT, CHE, PHY,	2	0	0	0	2	50	50	100	2
5	PCC	21MEL46	Mechanical Measurements and Metrology Lab	ME	0	0	2	0	3	50	50	100	1
6	HSMC	21KSK47	Samskrutika Kannada	HSMC	1	0	0	0	1	50	50	100	1
		21KBK47	Balake Kannada										
		Or											
		21CIP47	Constitution of India & Professional Ethics										
8	AEC	21ME48X	Ability Enhancement Course- IV	ME	1	0	0		1	50	50	100	1
9	UHV	21UH49	Universal Human Values & Professional Ethics		1	0	0		1	50	50	100	1
TOTAL									20	450	450	900	20

**Note:** **BSC:** Basic Science Course, **PCC:** Professional Core Course, **HSMC:** Humanity and Social Science & Management Courses, **AEC** – Ability Enhancement Courses. **INT** – Internship, **UHV** – Universal Human Value Courses, **IPCC:** Integrated Professional Core Course.

**L**–Lecture, **T**–Tutorial, **P**–Practical/Drawing, **S**–Self Study Component, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Examination

**21KBK47BalakeKannada** is for non-Kannada speaking, reading, and writing students, and **21KSK47Samskrutika**

**Kannada** is for students who speak, read and write Kannada.

**Summer Internship-II (21INT58):** shall be carried out at industrial (State and Central Government /Non-government organizations (NGOs)/Micro, Small and Medium Enterprise (MSME)/Innovation centers/ Incubation centers. The internship can also be Rural internship. All the students admitted shall have to undergo a mandatory internship of 04 weeks during the intervening vacation of IV and V semesters. A University Viva-Voce examination (Presentation followed by Question & Answer session) shall be conducted during V semester and the prescribed credit shall be included in the V semester. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements. (The faculty coordinator or mentor has to monitor the students' internship progress and interact to guide them for the successful completion of the internship.)

**Summer Internship-II: SEE** shall be through seminar and viva-voce.

**The course prescribed to lateral entry Diploma holders admitted to II semesters of Engineering programs**

10	NCMC	21MATDIP41	Additional Mathematics-II	Maths	02	02	--			100	---	100	0
<p>1. The mandatory non – credit courses <b>Additional Mathematics II</b> prescribed for IV semester, to the lateral entry Diploma holders admitted to III semesters BE/B.Tech., programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40% of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear for CIE.</p> <p>2. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree</p>													
<p><b>Integrated Professional Core Course (IPCC):</b> refers to Professional Theory Core Course Integrated with Practical of the same course. Credit for IPCC can be 04 considering L:T:P as 3:0:2 or L:T:P as 2:2:2. Theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by CIE only and there shall be no SEE. For more details the regulation governing the Degree of Bachelor of Engineering /Technology (BE/B.Tech.,) 2021-22 may be referred.</p>													

**Ability Enhancement Courses-IV**

21ME481	Introduction to AI and ML
21ME482	Economics for Engineers
21ME483	Introduction to Data Analytics
21ME484	Introduction to IOT
21ME485	Introduction to Uncertainty Analysis and Experimentation



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B.E.in Mechanical Engineering													
Scheme of Teaching and Examinations 2021													
Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)													
(Effective from the academic year 2021-22)													
V SEMESTER													
Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours / Week				Examination				Credit
					Theory Lecture	Tutorial	Practical / Drawing	Self Study	Duration In hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC	21ME51	Theory of Machines	ME	2	2	0	0	3	50	50	100	3
2	IPCC	21ME52	Thermo-fluids Engineering	ME	3	0	2	0	3	50	50	100	4
3	PCC	21ME53	Computer Integrated Manufacturing	ME/IPE	2	0	2	0	3	50	50	100	3
4	PCC	21ME54	Modern Mobility and Automotive Mechanics	ME	3	0	0	0	3	50	50	100	3
5	PCC	21MEL55	Design lab	ME	0	0	2	0	3	50	50	100	1
6	AEC	21XX56	Research Methodology & Intellectual Property Rights	Any Dept.	2	0	0	0	2	50	50	100	2
7	INT	21INT57	Summer Internship-II		Completed during the vacation of IV and V semesters				3	50	50	100	3
8	HSMC	21CIV58	Environmental Studies	Civil/Environmental Chemistry / Biotech	1	0	0	0	1	50	50	100	1
				[Paper setting: Civil Engineering Board]									
TOTAL									21	400	400	800	20
9	NCMC	21PE59/21Y059/21NSS9	Physical Education (Sport & Athletics)/YOGA & NSS	PE/NSS	-	-	2			50	50	100	0
Note: BSC: Basic Science Course, PCC: Professional Core Course, HSMC: Humanity and Social Science & Management Courses, AEC – Ability Enhancement Courses. INT – Internship, IPCC: Integrated Professional Core Course.													



<b>L</b> –Lecture, <b>T</b> –Tutorial, <b>P</b> –Practical/Drawing, <b>S</b> –SelfStudyComponent, <b>CIE</b> :ContinuousInternalEvaluation, <b>SEE</b> :SemesterEndExamination	
1. The mandatory non – credit courses <b>Physical Education (Sport and Athletics), Yoga and NSS I and II</b> prescribed for V and VI semesters respectively, to the students admitted to V semester of B.E./B.Tech., programs, shall attend corresponding the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/fails to secure the minimum of 40% of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear for SEE.	
2. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.	
3. The students who take a course on Physical education he/she has to take up the semester-end practical examination prescribed for 100 marks. The students who opt for the NSS course have to submit reports and attend to viva-voce examination. The marks for the report shall be 50 marks and for presentation and viva-voce 50 marks.	
<b>Integrated Professional Core Course (IPCC):</b> It refers to Professional Theory Core Course Integrated with Practical of the same course. Credit for IPCC can be 04 considering L:T:P as 3:0:2 or L:T:P as 2:2:2. For an IPCC, the theory part shall be evaluated by both CIE and SEE, and the practical part is evaluated by CIE only (there shall be no semester-end examination (SEE) for the practical part). For more details the regulation governing the Degree of Bachelor of Engineering /Technology (BE/B.Tech.) 2021-22 may be referred.	

Visvesvaraya Technological University, Belagavi <b>B.E.in Mechanical Engineering</b> Scheme of Teaching and Examinations 2021 Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2021-22)													
VISEMESTER													
Sl.No	Course and Course Code		Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
					Theory Lect	Tutorial	Practical/Drawing	Self Study	Duration	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	HSMC	21ME61	Production and Operations Management	ME/IPE	3	0	0	0	3	50	50	100	3
2	IPCC	21ME62	Heat Transfer	ME	2	2	2	0	3	50	50	100	4
3	PCC	21ME63	Machine design	ME	2	2	0	0	3	50	50	100	3
4	PEC	21ME64x	Professional Elective Course-I	ME	3	0	0	0	3	50	50	100	3
5	OEC	21ME65x	Open Elective Course-I	ME	3	0	0	0	3	50	50	100	3
6	PCC	21MEL66	Computer Aided Modeling and FEA Lab	ME	0	0	2	0	3	50	50	100	1
7	MP	21MEM67	Mini Project	ME				0	3	100		100	2
8	AEC	21ME68X	Ability Enhancement Course-V		1	0	0	0	1	50	50	100	1
<b>TOTAL</b>									22	<b>400</b>	<b>400</b>	<b>800</b>	<b>20</b>
<b>9</b>	<b>NCMC</b>	<b>21PE69/21YO69/21NS69</b>	<b>Physical Education (Sport &amp; Athletics)/YOGA &amp; NSS</b>	<b>PE/NSS</b>	-	-	<b>2</b>			<b>50</b>	<b>50</b>	<b>100</b>	<b>0</b>
<b>Note:</b> BSC: Basic Science Course, PCC: Professional Core Course, HSMC: Humanity and Social Science & Management Courses, PEC: Professional Elective Courses, OEC – Open Elective Course, AEC – Ability Enhancement Courses. MP – Mini Project, IPCC: Integrated Professional Core Course													
<b>L</b> –Lecture, <b>T</b> –Tutorial, <b>P</b> –Practical/Drawing, <b>S</b> –Self Study Component, <b>CIE</b> : Continuous Internal Evaluation, <b>SEE</b> : Semester End Examination													
4. The mandatory non – credit courses <b>Physical Education (Sport and Athletics), Yoga and NSS I and II</b> prescribed for V and VI semesters respectively, to the students admitted to V semester of B.E./B.Tech., programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40% of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear for SEE.													

<p>5. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.</p> <p>1. The students who take course on Physical education he has to take up practical examination for SEE. The students who take NSS course have to submit report, for SEE has to present (PPT) and answer vivo-voce for marks in the ratio 50:50</p>
<p><b>Research/Industrial Internship (21INT82)</b>– At the End of the sixth / Seventh semester (in two cycles to accommodate all the students of the University) Research/Industrial Internship shall be carried out – Based on industrial/Govt./NGO/MSME/Rural Internship/Innovation/Entrepreneurship. All the students admitted shall have to undergo a mandatory internship of <b>24 weeks</b> during the vacation of VI/VII semesters. A University Viva-Voce examination shall be conducted during VII/VIII semester and the prescribed credit shall be included in VII/VIII semester. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements.</p>
<p><b>Research internship</b> Students have to take up research internships at Centers of Excellence (CoE) / Study Centers established in the same institute and /or out of the institute at reputed research organizations / Institutes. A research internship is intended to give you the flavor of current research going on in a particular topic/s. This helps students get familiarized with the field, the skill needed the effort amount and kind of effort required for carrying out research in that field.</p> <p><b>Industry internships:</b> Is an extended period of work experience undertaken by students looking to supplement their degree with professional development. The students are allowed to prepare themselves for the workplace and develop practical skills as well as academic ones. 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 knowledge with practical constraints. The student can take up Interdisciplinary Industry Internship. Students can undergo industry internships in recognized industries from local/within the state/within the country/abroad within the stipulated time as mentioned in the scheme. The faculty coordinator or mentor has to monitor the students' internship progress and interact to guide them for the successful completion of the internship. University shall not bear any expenses incurred in respect of internship.</p>
<p><b>Mini-project work:</b> 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. (or Mini Project is a laboratory-oriented course which will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications) CIE procedure for Mini-project:</p> <p>(i) <b>Single discipline:</b> 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 Mini-project work shall be based on the evaluation of project report, project presentation skill, and question and answer session in the ratio of 50:25:25. <b>The marks awarded for the project report shall be the same for all the batch mates.</b></p> <p>(ii) <b>Interdisciplinary:</b> Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the college. The CIE marks awarded for the Mini-project, shall be based on the evaluation of 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><b>SEE for Mini-project:</b></p> <p>(i) <b>Single discipline:</b> Contribution to the Mini-project and the performance of each group member shall be assessed individually in the semester-end examination (SEE) conducted at the department.</p> <p>(ii) <b>Interdisciplinary:</b> Contribution to the Mini-project and the performance of each group member shall be assessed individually in semester-end examination (SEE) conducted separately at the department to which the student/s belongs.</p>

**Professional Elective Courses (PEC):**

A professional elective (PEC) course is intended to enhance the depth and breadth of the educational experience in the selected stream of the Engineering & Technology curriculum. Multidisciplinary courses that supplement the programs have been added as elective courses. These courses deal with the latest trend and advanced technology in the selected stream of engineering. Three groups of PEC are made available for undergraduate students in the curriculum. Each group will provide an option to select one out of four to five. Each group of Professional Elective Courses contains all stream courses, which will help the students to select and study particular stream course of his interest. (Courses which are common to AU, ME, IP Board should have the same code) Similarly for (CSE, ISE, MCA) and (CV, Arch, Mining) and (EEE, ECE, EIE,) and (CH, SX, TX).

The minimum students' strength for offering professional electives is 05, if the strength is less than the 05 then the college has to take the permission to offer the course.

Professional Elective Courses may be Integrated courses having both Theory and Practical syllabus, However total credits for the course shall remain (L:T:P = 2:0:2)/(L:T:P = 1:2:2) = 03 only.

**Integrated Professional Core Course (IPCC):** It refers to Professional Theory Core Course Integrated with Practicals of the same course. Credit for IPCC can be 04 considering L:T:P as 3:0:2 or L:T:P as 2:2:2. For an IPCC, theory part shall be evaluated by both CIE and SEE and practical part be evaluated by CIE only (there shall be no semester end examination (SEE) for the practical part). For more details the regulation governing the Degree of Bachelor of Engineering /Technology (BE/B.Tech) 2021-22 may be referred.

**Open Elective Courses:**

All Open Electives are offered to students of all branches in general. However, a student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the Program. Students can select any one of the open electives offered by other Departments except those that are offered by the parent Department (Please refer to the list of open electives). Selection of an open elective shall not be allowed if,

- The candidate has studied the same course during the previous semesters of the program.
- The syllabus content of open electives is similar to that of the Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the program.
- Registration to electives shall be documented under the guidance of the Program Coordinator/Advisor/Mentor.

Courses from Law, Business (MBA), Medicine, Arts, Commerce, may be offered as Open Elective Courses (OEC). However, the college has to take approval from the University if such courses are not listed in the group at least one month before the commencement of the semester.

The minimum students' strength for offering professional electives is 05, if the strength is less than the 05 then colleges have to take the permission to offer the course from the University.

**Professional Core Course (Integrated):** Theory Syllabus of Professional Core Courses integrated with Practical Syllabus of the same course. Credit for integrated subject will be (L: T: P = 3:0:2)/(L:T:P = 2:2:2) = 04. In such a course there is no Semester End Examination (SEE) for the practical syllabus of the course, however Continuous Internal Evaluation (CIE) will be conducted for the practical topics.

Professional Elective Courses-I		Open Elective Courses-I	
Subject Code	Title	Subject Code	Title
21ME641	Introduction to Project and Finance Management	21ME651	Mechatronics application in Manufacturing
21ME642	Smart Manufacturing	21ME652	Industrial Automation
21ME643	Mechatronic System Design	21ME653	Value Engineering and Life cycle costing
21ME644	Mechanical Vibrations and control	21ME654	Project Management
21ME645	Power Plant Technology	21ME655	<b>NCC</b>
21ME646	Finite Element Analysis		

Ability Enhancement Courses-V	
21ME681	Basics of Scientific computing language
21ME682	PYTHON for Data science
21ME683	Leadership
21ME684	<i>QC Problem Solving</i>
21ME685	<i>Reverse Engineering</i>

VisvesvarayaTechnologicalUniversity,Belagavi													
B.E.inB.E.in Mechanical Engineering													
SchemeofTeachingandExaminations 2021													
Outcome-Based Education(OBE) and Choice Based Credit System (CBCS)													
(Effectivefromtheacademic year 2021-22)													
VII/VIIISEMESTER													
Sl.No	Course and Coursecode		CourseTitle	TeachingDepartm ent	TeachingHours/We ek			SelfStudy	Examination				Credits
					TheoryLectu re	Tutorial	Practical /Drawing		Durationin Hours	CIE Marks	SEEMarks	TotalMarks	
1	PCC	21ME71	Automation and Robotics	ME	2	0	2	0	3	50	50	100	3
2	PEC	21ME72X	ProfessionalelectiveCourse-II	ME	3	0	0	0	3	50	50	100	3
3	PEC	21ME73X	ProfessionalelectiveCourse-III	ME	3	0	0	0	3	50	50	100	3
4	OEC	21ME74X	OpenelectiveCourse-II	ME	3	0	0	0	3	50	50	100	3
5	Project	21MEP75	Projectwork	ME					3	100	100	200	10
6	AEC	21ME76X	Ability Enhancement Course –VI (Online)	ME	2	0	0		2	--	- -	--	2
TOTAL									17	300	300	600	24

OR

VIII/VII SEMESTER(1)												
Sl.No	Course and Course code		Course Title	Teaching Dept	Teaching Hours/Week			Examination				Credits
					Theory	Tutorial	Practical / Drafting	Duration	CIE	SEE Mark	Total Marks	
					L	T	P					
1	Seminar	21XXS81	Technical Seminar	ME					100	--	100	01
2	Internship	21INT82	Research/Industry Internship*	ME					100	100	200	15
TOTAL									200	100	300	16
<b>Note:(1)</b> Institutions can swap 7 <sup>th</sup> and 8 <sup>th</sup> Semester Course work to accommodate industry/research internship at the end of the sixth semester (2) Credit earned for the course work shall be credited to the corresponding semester, i.e., 7 <sup>th</sup> or 8 <sup>th</sup> whether 7 <sup>th</sup> and 8 <sup>th</sup> semesters were completed during the first half or second half of the IV year of program												
<b>Research / Industry Internship-(21INT82):</b> shall be as far as possible be interdisciplinary in nature. If a provision is there all the students of the program can take up an internship in the 8 <sup>th</sup> semester, if not 50% of students can take internship-III at the 7 <sup>th</sup> -semester level, and the remaining 50% of students can take in 8 <sup>th</sup> -semester level.												



**Note:** **PCC:** Professional Core Course, **PEC:** Professional Elective Courses, **OEC** –Open Elective Course, **AEC** –Ability Enhancement Courses. **INT** – Internship,

**L**–Lecture, **T**–Tutorial, **P**–Practical/Drawing, **S**–Self Study Component, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Examination

**AICTE activity Points:** In case students fail to earn the prescribed activity Points, the Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

Activity points of the students who have earned the prescribed AICTE activity Points shall be sent to the University along with the CIE marks of 8th semester. In case of students who have not satisfied the AICTE activity Points at the end of the eighth semester, the column under activity Points shall be marked NSAP (Not Satisfied Activity Points).

**TECHNICAL SEMINAR(21MES81):** The objective of the seminar is to inculcate self-learning, face the audience confidently, enhance communication skill, involve in group discussion, and present and exchange ideas. Each student, under the guidance of a Faculty, shall choose, preferably, a recent topic of his/her interest relevant to the program of Specialization.

- Carry out literature survey, systematically organize the seminar content.
- Prepare the report with own sentences, avoiding a cut and paste act.
- Type the matter to acquaint with the use of Micro-soft equation and drawing tools or any such facilities.
- Present the seminar topic orally and/or through PowerPoint slides.
- Answer the queries and involve in debate/discussion.
- Submit a typed report with a list of references.

The participants shall take part in the discussion to foster a friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

**Evaluation Procedure:**

The CIE marks for the seminar shall be awarded (based on the relevance of the topic, presentation skill, participation in the question and answer session, and quality of report) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three teachers from the department with the senior-most acting as the Chairman.

**Marks distribution for CIE of the course:**

Seminar Report: 50 marks

Presentation skill: 25 marks

Question and Answer: 25 marks. ■

**PROJECT WORK (21MEP75):** The objective of the Project work is- To encourage independent learning and the innovative attitude of the students. To develop interactive, communication, organization, time management, and presentation skills. To impart flexibility and adaptability. To inspire independence and team working. To expand intellectual capacity, credibility, judgment, intuition. To adhere to punctuality, setting and meeting deadlines. To instill responsibilities to oneself and others. 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 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.

Professional Elective Courses-II		Professional Elective Courses-III	
Subject Code	Title	Subject Code	Title
21ME721	Refrigeration and Air conditioning	21ME731	Product Design and Ergonomics
21ME722	Additive Manufacturing	21ME732	Computational Fluid Dynamics
21ME723	Statistical Quality Control	21ME733	Design of Experiments
21ME724	MEMS and Microsystem Technology	21ME734	TQM
21ME725	Design for Manufacturing and Assembly	21ME735	Digital Fabrication
21ME726	Artificial Intelligence and IoT application in Manufacturing Process	21ME736	Theory and Design of IC Engines

Open Elective Courses-II		Ability Enhancement Courses-VI Online Course list	
Subject Code	Title	Subject Code	Title
21ME741	Non-traditional Machining	21ME761	Augmented Reality and WEB Design
21ME742	Smart Materials and Intelligent system Design	21ME762	Finance for Engineers
21ME743	Hydraulics and Pneumatics	21ME763	Python for AI and Development Project
21ME744	Entrepreneurship and Business Planning	21ME764	Basics of Digital Marketing
21ME745	Course on NCC	21ME765	Autonomous Vehicles

**Evaluation of the Theory and Practical Integrated Courses (TPICs):**

- 1 The credit for TPICs shall be 04. This may be subdivided in any appropriate form depending on the type of course, however, ensuring at least 2 hours for hands-on experience at the laboratory.

The 04 credits can be arranged to have the following teaching hours.

**(a)** 3L:0T:1P, 4 credits, 05 hours.

**(b)** 2L:1T:1P, 4 credits, 06 hours.

In both the cases (i.e., a and b above), the syllabus of the theory part shall be designed for 40 hours and the number of experiments/ programmes shall be sufficient enough to cover in 12 to 14 days of 16-week duration of the semester.

- 2 The maximum marks for TPICs shall be 100 marks.
- 3 Fifty marks of the maximum marks of TPICs shall be for CIE and the other 50 marks shall be for SEE of the theory part of TPICs.
- 4 The CIE marks for the theory part of the TPIC shall be 30 and for the laboratory part 20.
- 5 As continuous evaluation has been given more importance in NEP 2020, the minimum marks to be secured in CIE to appear for SEE shall be respectively 15 and 10. The laboratory part of the TPICs shall be for CIE only.
- 6 The theory part of the TPICs shall be for both CIE and SEE.
- 7 As continuous evaluation has been given more importance in NEP 2020, attendance shall separately be counted for theory and laboratory.
- 8 A minimum of **85 % attendance is** to be put in for both theory and laboratory, with the condonation clause equally applying to both theory and laboratory.
- 9 In case, students fail to satisfy the attendance requirement of either the theory part or laboratory part of the TPIC, students shall not be permitted to appear for SEE of that semester and shall not be permitted to take admission to the next higher semester. The candidate shall be required to repeat that semester during the subsequent year.
- 10 In case, students satisfy the attendance requirement of both theory and laboratory part of the TPIC, but fail to secure the minimum CIE marks in any one of the two, such students shall not be permitted to appear for SEE of course. In such events, students shall be considered as fail in such a course and the same shall be considered for vertical progression.  
  
Such students shall be permitted to register afresh and appear for SEE after satisfying the CIE requirements of the theory part (with or without satisfying the attendance requirement) or CIE requirements of the laboratory part, both when offered during the subsequent semester.
- 11 Each appearance to SEE to complete a course shall be treated as an attempt.

- 12 The theory paper examination shall be conducted for a maximum of 100 marks. The marks secured by students shall be reduced proportionately to 50 marks. The fractional value that results when secured marks are reduced to 50 shall be rounded off to a higher integer. For a pass in SEE, the minimum marks to be scored by students shall be 20 out of 50 or 40 out of 100.
- 13 The CIE marks awarded for tests in the theory of TPICs shall be based on three tests generally conducted at the end of a fifth, tenth, and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 20 marks.
- 14 Out of the remaining 10 marks, 05 marks shall be considered for the assignments /unit-tests/written quizzes and other 05 marks for open-book tests, for self-study or to test problem-solving skills.
- 15 On completion of every experiment/programme in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- 16 While 15 marks are for conducting the experiment and preparation of the laboratory record, the other 05 marks shall be for the test conducted at the end of the semester.
- The final CIE marks for the TPICs shall be the sum of the CIE marks earned for the theory and laboratory parts marks.
- 17 The eligibility to appear for SEE of TPICs shall be subject to the condition that students have earned minimum CIE marks separately in theory and practical parts of TPICs.
- 18 CIE marks of TPICs shall be submitted to the University in the format shown below.

Course code of TPIC		
CIE marks of theory part	CIE marks of laboratory part	Total
25	12	37