VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
SchemeofTeachingandExaminations–2022-23 M.Tech.,
Electronics
Choice Based Credit System(CBCS)and Outcome-Based Education(OBE)

I SEMESTER

Sl.No	Course	Course Code	Course Title	Teaching Hours per Week			Examination				Credits
				Theory	Practical/Seminar	Tutorial/Skill Development Activities	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	T/SDA					
1	BSC	22LEL11	Advanced Engineering Mathematics	03	00	02	03	50	50	100	3
2	IPCC	22LEL12	Digital VLSI Design	03	00	02	03	50	50	100	4
3	PCC	22LEL13	Advanced Embedded System	02	00	02	03	50	50	100	4
4	PCC	22LEL14	Digital Circuits and Logic Design	02	00	02	03	50	50	100	3
5	PCC	22LEL15	Wireless Sensor Networks	02	00	02	03	50	50	100	3
6	MCC	22RMI16	Research Methodology and IPR	02	00	02	03	50	50	100	3
7	PCCL	22LELL17	Embedded System Lab	01	02	00	03	50	50	100	2
8	AUD/AEC	22AUD18/ 22AEC18	BOS recommended ONLINE courses	Classes and evaluation procedures are a per the policy Of the online course providers.							PP
			TOTAL	**17**	**04**	**06**	**21**	**350**	**350**	**700**	**22**

Note: BSC-Basic Science Courses, PCC: Professional core. IPCC-Integrated Professional Core Courses, MCC- Mandatory Credit Course, AUD/AEC–AuditCourse/AbilityEnhancement Course(ApassinAUD/AECismandatoryfortheawardofthedegree),PCCL-Professional Core Course lab, L-**Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities** (Hours are for Interaction between faculty and

Integrated Professional Core Course (IPCC): **Integrated Professional Core Course (IPCC)**: Refers to Professional Theory Core Course Integrated with practical of the same course. 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.

AuditCourses/AbilityEnhancementCoursesSuggestedbyBOS(ONLINEcourses): AuditCourses: These are prerequisite courses suggested by the concerned Board of Studies. Ability Enhancement Courses will be suggested by the BoS if prerequisite courses are not required for the programs.

Ability Enhancement Courses:

- These courses are prescribed to help students to enhance their skills in in fields connected to the field of specialisation as well allied fields that leads to employable skills. Involving in learning such courses are impetus to lifelong learning.
- Thecoursesunderthiscategoryareonlinecoursespublishedinadvanceand approved by the concerned Board of Studies.
- RegistrationtoAudit/AbilityEnhancementCourseshallbedoneinconsultationwiththementorandiscompulsoryduringtheconcerned semester.
- In case a candidate fails to appear for the proctored examination or fails to pass the selected online course, he/she can register and appear forthe same course if offered during the next session or register for a new course offered during that session, in consultation with the mentor.
- TheAudit/AbilityEnhancementCoursecarriesnocreditandisnotcountedforverticalprogression.However,apassinsuchacourseis mandatory for the award of the degree.

Skilldevelopmentactivities:UnderSkilldevelopmentactivitiesinaconcerningcourse,thestudentsshould

1. Interact with industry(small, medium, and large).
2. Involveinresearch/testing/projectstounderstandtheirproblemsandhelpcreativeandinnovativemethodstosolvetheproblem.
3. Involve in case studies and field visits/ fieldwork.
4. Accustom to the use of standards/codes etc., tonarrow the gap between academia and industry.
5. Hand lead vanced instruments to enhance technical talent.
6. Gain confidence in modeling of systems and algorithms for transient and steady-state operations ,thermal study,etc.
7. Workondifferentsoftware/s(tools)tosimulate,analyseandauthenticatetheoutputtointerpretandconclude.

Allactivitiesshouldenhancestudent'sabilitiestoemploymentand/orself-employmentopportunities,managementskills,Statisticalanalysis,fiscal expertise, etc.

Students and the course instructor/s to involve either individually or in groups to interact together to enhance thel earning and application skills of thestudytheyhaveundertaken.Thestudentswiththehelpofthecourseteachercantakeuprelevanttechnical –activitie swhich will enhance their skill. The prepared report shall be evaluated for CIE marks.

Advanced Embedded System			
Course Code	22LEL13	CIE Marks	50
Teaching Hours/Week(L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	25 Hoursofteachingand10-12sessions For Skill Development Activities	Total Marks	100
Credits	4	Exam Hours	03

Course Learning Objectives:

- To understand the concepts of embedded system design.
- To earn real design challenges of the system under development.
- To gain the essential knowledge required to design practical real-time embedded systems and appropriate real –time operating system (RTOS) product to be used.
- To know networking aspect sof the embedded systems and Hardware-Software Co-design.

Module-1

Introduction of Embedded System: Embedded System: Embedded vs General computing system, classification, application and purpose of ES.
Typical of Embedded System: Communication Interface
TheStrategy: Definition,CommonCharacteristics,SomeQualityMetricsinESDesign,VersatilityFactorsforESProduct, Technologies Involved (Processors, Platforms, Devices-IC Technology), Hardware/Software Co-design
Use Cases: What Are Use Cases, CasualVersusStructuredVersion,BlackBoxVersusWhiteBox,HubandSpokeModel,
Details of the Use Case Model Entities (Actor, Stakeholder, Primary Actor, Supporting Actor, Scope, Scenarios, Levels, Use Case Entities and Their Relation, When Are We Done, Standard Use Case Template)

Teaching-LearningProcess	Chalk and talk method/PowerPoint Presentations

Module-2

Models and Architectures: Representation of a Design, Model Taxonomy, Finite-State Machine (Mealy) Model, Petri Nets, Hierarchical Concurrent FSMs, Activity-Oriented Data Flow Graphs, Control Flow Graphs (Flowchart), Structure-Oriented Models, Data-Oriented Entity-Relationship Model, Jackson's Structured Programming Model, Heterogeneous Models

Teaching-LearningProcess	Chalk and talk method/Power Point Presentations

Module-3

Specification Languages: System C: Characteristics of ESL for Embedded Systems,System C,Processes.
UML for Embedded Systems: Motivation, Typical Tasks and Roles in System Engineering, UML Diagrams, Structural Diagrams, Behavioural Diagrams

Teaching-LearningProcess	Chalk and talk method/PowerPoint Presentations

Module-4

Real-Time Systems: Definition and Examples, Broad Classification of RTS, Terms in RT Systems, Periodic Schedule, Precedence Constraints and Dependencies, Scheduling Algorithms–Classification, Clock-Driven Scheduling, Priority-Driven Periodic Tasks, Dynamic Priority Algorithms, Scheduling Sporadic Jobs, Resource Access and Contention.
Real-Time Operating Systems (RTOS): Introduction, RTOS Concepts, Basic Design Using RTOS Case Study 1, Concept-Process and Threads.

Teaching-Learning Process	Chalk and talk method/Power Point Presentations

Module-5

Real-TimeOperatingSystems(RTOS): Posix,pThreads,ThreadSynchronization,DesignStrategies
Networked Embedded Systems (NES): Introduction, Characteristics, Broad Segments of NES, Automotive NES, CAN (Controller Area Network).
HW-SWCo-design: Introduction,FactorsDrivingCo-design,Co-designProblems,ConventionalModelforHW-SWDesignProcess, Integrated Co-design Process, System Partitioning, Partitioning Algorithms.

Teaching-Learning Process	Chalk and talk method/PowerPoint Presentations

Assessment Details(both CIE and SEE)
The weightageofContinuousInternalEvaluation(CIE)is50%andforSemesterEndExam(SEE)is50%.Theminimumpassingmark

For the CIE is 50%ofthe maximum marks. Minimum passing marks in SEE is 40%ofthemaximummarks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student securesnotless than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Three Unit Tests each of**20Marks**
2. Twoassignmentseachof**20Marks**or**oneSkillDevelopmentActivityof40 marks**
   To attain the COs and POs

Thesumofthreetests,twoassignments/skillDevelopmentActivities,willbe **scaleddownto50marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEEquestionpaperwillbesetfor100marksand themarksscoredwillbeproportionatelyreducedto50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full questionis for20 marks.There will be two full questions(with a maximum off ours ub-questions)from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. Thestudentswillhavetoanswerfivefullquestions,selectingonefullquestionfromeach module

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Suggested Learning Resources:

Books

1. (Transactionsoncomputersystemsandnetworks)k.c.s.murti-designprinciplesforembeddedsystems-springer(2022)
2. IntroductiontoembeddedsystemsK.V.ShibuTMHeducationPvt.Ltd.2009
3. Embeddedsystems-AcontemporarydesigntoolJamesK.PeckolJohnWiley2008
4. TheDefinitiveGuidetotheARMCortex-M3JosephYiuNewnes,(Elsevier)2ndedn,2010.

Weblinks and Video Lectures (e-Resources):

1. https://youtu.be/GaZBpY9Ys1Y
2. https://youtu.be/SUusup7FfJo
3. https://youtu.be/dHsHP9RrXBw?list=PLJ5C_6qdAvBH-JNRIlupFb44miyx9M8JD
4. https://youtu.be/vn7aT9-cYzQ
5. https://youtu.be/-rWGzFDLnAY

Skill Development Activities Suggested:

1. Inter act with industry (small, medium,and large).
2. Involveinresearch/testing/projectstounderstandtheirproblemsandhelpcreativeandinnovativemethodstosolvethe problem.
3. Involve in case studies and field visits/ fieldwork.
4. Accustom to the use of standards/codes etc.,to narrow the gap between academia and industry.
5. Handle advanced instruments to enhance technical talent.
6. Gain confidence in modeling of systems and algorithms for transient and steady-state operations ,thermal study, etc.
7. Work on different software/s(tools)to simulate, analyze and authenticate the out put to interpret and conclude.

All activities should enhance student's abilities to employment and/or self-employment opportunities, management skills, Statistical analysis, fiscal expertise, etc.

Students and the course instructor/s to involve either individually or in groups to interact together to enhance the learning and application skills of the study they have undertaken. The students with the help of the course teacher can take up relevant technical – activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

Attheend of the course the student will be able to:

Sl.No.	Description	Blooms Level
CO1	Design and Develop Embedded Systems with hardware software co-design.	L3
CO2	AnalyzedifferentmodelsandarchitectureoftheEmbeddedSystemsandNetworkedEmbedded Systems	L4
CO3	Verify the performance of RTS and RTOS	L3,L4