Sri Indu Institute of Engineering & Technology

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Affiliated to JNTUH, Hyderabad.

COURSE FILE

ON

EMBEDDED SYSTEM DESIGN

Course Code – EC613PC

III B.Tech II-SEMESTER

A.Y.: 2022-2023

Prepared by

Mrs. A.Vaani
Assistant Professor

Head of the Department
Electronics and Communication Engg. Dept
SRI INDU INSTITUTE OF ENGG & TECH
Sheriguda(V), Ibrahimpatnam(M), R.R.Dist-501 510

PRINCIPAL
Sri Indu Institute of Engineering & Tech
Sheriguda(Vill), Ibrahimpatnam
R.R. Dist. Telangana-501 510.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Academic Year	2022-2023
Course Title	EMBEDDED SYSTEM DESIGN
Course Code	EC613PC
Programme	B. Tech
Year & Semester	III year II-semester
Branch & Section	ECE-A
Regulation	R18
Course Faculty	Mrs.A. Vaani, Assistant Professor

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INSTITUTE VISION AND MISSION

Vision:

To become a premier institute of academic excellence by providing the world class education that transforms individuals into high intellectuals, by evolving them as empathetic and responsible citizens through continuous improvement.

Mission:

IM1: To offer outcome-based education and enhancement of technical and practical skills.

IM2: To Continuous assess of teaching-learning process through institute-industry collaboration.

IM3: To be a centre of excellence for innovative and emerging fields in technology development with state-of-art facilities to faculty and students' fraternity.

IM4: To Create an enterprising environment to ensure culture, ethics and social responsibility among the stakeholders.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT VISION AND MISSION

Vision:

To become a recognized center in the field of Electronics and Communication Engineering by producing creative engineers with social responsibility and address ever-changing global challenges.

Mission:

DM1: To facilitate an academic environment that enables student's centric learning.

DM2: To provide state-of-the-art hardware and software technologies to meet industry requirements.

DM3: To continuously update the Academic and Research infrastructure.

DM4: To Conduct Technical Development Programs for overall professional caliber of Stake Holders.

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PROGRAM EDUCATIONAL OBJECTIVES

Program Educational objectives are to Promote:

PEO1: Graduates with a strong foundation in Electronics and Communication Engineering, Science and Technology to become successful in the chosen professional career.

PEO2: Graduates with ability to execute innovative ideas for Research and Development with continuous learning.

PEO3: Graduates inculcated with industry based soft-skills to enable employability.

PEO4: Graduates demonstrate with ability to work in interdisciplinary teams and ethical professional behavior.

PROGRAM SPECIFIC OUTCOMES

PSO 1: Design Skills: Design, analysis and development a economical system in the area of Embedded system & VLSI design.

PSO 2: Software Usage: Ability to investigate and solve the engineering problems using MATLAB, Keil and Xilinx.

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PROGRAM OUTCOMES

1. **ENGINEERING KNOWLEDGE**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **PROBLEM ANALYSIS**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **DESIGN/DEVELOPMENT OF SOLUTIONS**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **MODERN TOOL USAGE**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **THE ENGINEER AND SOCIETY**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **ENVIRONMENT AND SUSTAINABILITY**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **ETHICS**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **INDIVIDUAL AND TEAM WORK**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **COMMUNICATION**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions.

11. **PROJECT MANAGEMENT AND FINANCE**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **LIFE-LONG LEARNING**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech. in ELECTRONICS AND COMMUNICATION ENGINEERING

III YEAR COURSE STRUCTURE AND SYLLABUS (R18)

Applicable From 2018-19 Admitted Batch

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	EC501PC	Microprocessors & Microcontrollers	3	1	0	4
2	EC502PC	Data Communications and Networks	3	1	0	4
3	EC503PC	Control Systems	3	1	0	4
4	SM504MS	Business Economics & Financial Analysis	3	0	0	3
5		Professional Elective - I	3	0	0	3
6	EC505PC	Microprocessors & Microcontrollers Lab	0	0	3	1.5
7	EC506PC	Data Communications and Networks Lab	0	0	3	1.5
8	EN508HS	Advanced Communication Skills Lab	0	0	2	1
9	*MC510	Intellectual Property Rights	3	0	0	0
		Total Credits	18	3	8	22

III YEAR II SEMESTER

S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	EC601PC	Antennas and Propagation	3	1	0	4
2	EC602PC	Digital Signal Processing	3	1	0	4
3	EC603PC	VLSI Design	3	1	0	4
4	EC613PE	Professional Elective - II	3	0	0	3
5		Open Elective - I	3	0	0	3
6	EC604PC	Digital Signal Processing Lab	0	0	3	1.5
7	EC605PC	e – CAD Lab	0	0	3	1.5
8	EC606PC	Scripting Languages Lab	0	0	2	1
9	*MC609	Environmental Science	3	0	0	0
		Total Credits	**18**	**3**	**8**	**22**

***MC - Environmental Science – Should be Registered by Lateral Entry Students Only.**

Note: Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

Professional Elective – I

EC511PE	Computer Organization & Operating Systems
EC512PE	Error Correcting Codes
EC513PE	Electronic Measurements and Instrumentation

Professional Elective – II

EC611PE	Object Oriented Programming through Java
EC612PE	Mobile Communications and Networks
EC613PE	Embedded System Design

EC613PC: EMBEDDED SYSTEM DESIGN

B.Tech. III Year II Semester **L T P C**

3 0 0 3

Prerequisite: Microprocessors and Microcontrollers; Computer Organization and Operating Systems

Course Objectives:

1. To provide an overview of Design Principles of Embedded System.
2. To provide clear understanding about the role of firmware.
3. To understand the necessity of operating systems in correlation with hardware systems.
4. To learn the methods of interfacing and synchronization for tasking.

Course Outcomes: Upon completing this course, the student will be able to

1. TounderstandtheselectionprocedureofProcessorsintheembeddeddomain.
2. Design ProcedureforEmbeddedFirmware.
3. To visualize the role of Real time Operating Systems in Embedded Systems.
4. ToevaluatetheCorrelationbetweentasksynchronizationandlatencyissues

UNIT-I:

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT-II:

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT-III:

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT-IV:

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT-V:

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, **Task Synchronization:** Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, Methods to Choose a n RTOS.

TEXTBOOKS:

1. Introduction to Embedded Systems-ShibuK.V,McGrawHill.

REFERENCEBOOKS:

2. Embedded Systems-Raj Kamal, MH.
3. Embedded System Design-FrankVahid, TonyGivargis, JohnWiley.
4. Embedded Systems–Lyla, Pearson,2013
   An Embedded Software Primer-David E.Simon, Pearson Education

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Website: https://siiet.ac.in/

COs and Mapping with PO/PSO

Course: EMBEDDED SYSTEMS DESIGN (C324) **Class: III ECE-A**

Course Outcomes

Aftercompletingthiscourse,thestudentwillbeableto:

C324.1: Describe the basics of an embedded system (Knowledge)
C324.2:Interpretthetypeofmemoryandinterfacingtoexternalworld(Application)
C324.3: Analyze the embedded firmwaredesign approaches (Analysis)
C324.4: Design the RTOS based embedded system for multitasking (Synthesis)
C324.5:Expressthetaskcommunication/synchronizationissues (Comprehension)
C324.6:Assesthemethodofdesigninganembeddedsystemforanytypeofapplication(Evaluation)

Mapping of course outcomes with program outcomes:

High -3 Medium -2 Low-1

PO /CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C324.1	2	-	2	-	-	-	-	-	-	-	-	-	3	2
C324.2	2	-	3	-	-	-	-	-	-	-	2	-	2	3
C324.3	2	-	2	-	-	-	-	-	-	-	-	2	3	2
C324.4	3	-	3	-	-	-	-	-	-	-	3	-	2	3
C324.5	2	-	2	-	-	-	-	-	-	-	-	2	2	3
C324.6	2	-	3	-	-	-	-	-	-	-	-	3	3	2
AVG	**2.17**	-	**2.5**	-	-	-	-	-	-	-	**2.5**	**2.3**	**2.5**	**2.5**

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CO- PO/PSO Mapping - Justification

Course: EMBEDDED SYSTEM DESIGN (C324) **Class: III ECE-A**

P01.ENGINEERING KNOWLEDGE: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
P02.PROBLEM ANALYSIS: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
P03. **DESIGN/DEVELOPMENT OF SOLUTIONS**: Design solutions for complex engineering problems and design system components or processes that meet t h e specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO11. PROJECT MANAGEMENT AND FINANCE: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

CO-PO mapping Justification

C324.1: Describe the basics of an embedded system (Knowledge)

	Justification
PO1	Studentscandefinetheembeddedsystem,historyandpurpose.
PO3	Basicsarethekeyfactorsindesigninganyapplications.
PSO1	Embeddedsystemsengineercancreateasystemthatnotonlymeetsthespecified requirements.
PSO12	Embeddedsystemsenhancestheefficiency,accuracy,andcollaborationaspectsofthe designprocess.

C324.2:Interpretthetypeofmemoryandinterfacingtoexternalworld(Application)

	Justification
PO1	Studentsacqireknowledgeonthecoreofembeddedsystemwithcommunicationinterfaces.
PO3	Studentscandesignapplicationwithknowledgeofprogrammemoryanddatamemory with interfacingcircuitry.
PO11	Applyingtheseprinciplesensuresthesuccessfuldevelopmentofembeddedsystemsthat meetbothtechnicalandfinancialobjectives.
PSO1	understandingmemorytypes,optimizingmemory usage,andeffectiveinterfacingwith the externalworldalignskills.
PSO2	Enablingengineerstodevelopeffectivesolutionsintheembeddedsystemsdomain.

C324.3Analyze the embedded firmware design approaches (Analysis)

	Justification
PO1	Studentsgettheknowledgeonresetcircuitandoscillatorunit.
PO3	Studentscandotheembeddedfirmwaredesignapproaches.
PO12	Abilitytointegrateengineeringandmanagementprinciplesiscrucialforsuccessful embeddedfirmwaredesignprojectsinmultidisciplinaryenvironments.
PS01	Embeddedfirmwaredesignapproachimpactsthedesign,analysis,anddevelopmentof economicalsystemsinthedomainsofbothEmbeddedSystemsandVLSIDesign.
PSO2	Firmwaredesignunderconsiderationandtheengineeringproblemsbeingaddressed.

C324.4 Design the RTOS based embeddedsystem formultitasking (Synthesis)

	Justification
PO1	Studentsgettheknowledgeonoperatingsystem.
PO3	Operatingsystem,multiprocessingandmultitaskingplaysanimportantroleindesigning anyapplication.
PO11	RTOS-basedembeddedsystemformultitaskinginvolvesadheringtoengineeringprinciples relatedtotask.
PSO1	Developmentofaneconomicalyethighlyfunctionalembeddedsystem
PSO2	Realtimeresponsiveness,efficientsourceutilization,androbustmultitaskingcapabilities.

C324.5 Express the task communication/synchronization issues(Comprehension)

	Justification
PO1	Studentsgettheknowledgehowto choosearealtimeoperating systemforembedded systemapplication.
PO3	Hardandsoftrealtimeoperatingsystemsconsideredbasedondesignmethodologies.
PO12	Techniqueandadapttotheever-evolvinglandscapeoftechnologicalchallengesinembeddedsystem.
PSO1	Approachthatoptimizesbothsystemperformanceandcost-effectiveness.
PSO2	Theintegration ofthesetoolsallowsforacomprehensiveand multidisciplinaryapproachto optimizesystem.

C324.5 Assesthemethodofdesigninganembeddedsystemforanytypeofapplication(Evaluation)

	Justification
PO1	Studentsgettheknowledgehowtochooseapplicationsbasedoncurrenttrendytechnology.
PO3	Theapplicationareasandtheproductsintheembeddedsystemdomainare countless.
PO12	Thisoptimizationinvolvesincorporatingthelatesttechnologies,minimizingresourceusage.
PSO1	Emphasizingthedesign,analysis,anddevelopmenttoolsofeconomicalsysteminthefieldofEmbeddedSystem.
PSO2	Processcontributetoaefficientapproach,allowingforoptimization,thoroughtesting,iterativeofthe system.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

ACADEMIC CALENDAR 2022-23

B. Tech./B. Pharm. III YEAR I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	**09.09.2022**	
2	1st Spell of Instructions (including Dussehra Recess)	09.09.2022	10.11.2022 (9 Weeks)
3	Dussehra Recess	03.10.2022	08.10.2022 (1 Week)
4	First Mid Term Examinations	11.11.2022	17.11.2022 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	24.11.2022	
6	2nd Spell of Instructions	18.11.2022	12.01.2023 (8 Weeks)
7	Second Mid Term Examinations	16.01.2023	21.01.2023 (1 Week)
8	Preparation Holidays and Practical Examinations	23.01.2023	28.01.2023 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	30.01.2023	
10	End Semester Examinations	30.01.2023	11.02.2023 (2 Weeks)

Note: No. of Working/ instructional days: 92

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**13.02.2023**	
2	1st Spell of Instructions	13.02.2023	08.04.2023 (8 Weeks)
3	First Mid Term Examinations	10.04.2023	15.04.2023 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	22.04.2023	
5	2nd Spell of Instructions (including Summer Vacation)	17.04.2023	24.06.2023 (10 Weeks)
6	**Summer Vacation**	15.05.2023	27.05.2023 (2 Weeks)
7	Second Mid Term Examinations	26.06.2023	01.07.2023 (1 Week)
8	Preparation Holidays and Practical Examinations	03.07.2023	08.07.2023 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	08.07.2023	
10	End Semester Examinations	10.07.2023	22.07.2023 (2 Weeks)

Note: No. of Working/ instructional days: 90

REGISTRAR

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Class Timetable

CLASS: III-B.Tech ECE-A | A.Y:2022-23 | SEMESTER: II | LH: C-201

TIME/ DAY	I 9:40-10:30	II 10:30 -11:20	III 11:20-12:10	IV 12:10-1:00	1:00-1:30	V 1:30-2:20	VI 2:20-3:10	VII 3:10-4:00
MON	A&P	DSP LAB / e-CAD LAB				VLSID	ESD	LIB
TUE	IM	DSP	FAI	ESD		DSP(T)/VLSID(T)	A&P	SPORTS
WED	ESD	IM	A&P	A&P(T)/DSP(T)	LUNCH	FAI	DSP	COUN
THU	IM	DSP	VLSID	VLSID(T)/A&P(T)		e-CAD LAB / DSP LAB		
FRI	FAI	DSP	A&P	VLSID		ESD	CO-CU/DAA	
SAT	VLSID	ESD	VLSID(ADJUNCT)			SL LAB		A&P

*(T) – Tutorial Concern Faculty

Course Code	Course Name	Name of the Faculty	Course Code	Course Name	Name of the Faculty
EC601PC	A&P-Antennas and Propagation	P.Krishna Rao	EC604PC	DSP LAB-Digital Signal Processing Lab	Y.Raju/Dr.T.Ramakrishna/ Dr.S.Anjaneyulu
EC602PC	DSP-Digital Signal Processing	Y.Raju	EC605PC	e-CAD LAB-e – CAD Lab	S.Alekhya/P.Rajendra/P.Krishna
EC603PC	VLSID-VLSI Design	S.Alekhya	EC606PC	SL LAB-Scripting Languages Lab	D.Nagaraju/P.Krishna Rao/ K.Bhaskar Reddy
EC613PE	ESD-Embedded System Design(Professional Elective-II)	A.Vaani	-	FAI-Fundamentals of Artificaial Intelligence	P.Meena
VLSID (ADJUNCT)	VLSID(ADJUNCT)	G.Chandrasekhar	COUN	Counseling	Y.Raju/K.Padma/G.Swathi
MT600OE	IM-Industrial Management (Open Elective-I)	K.V.Nagamani	SPORTS	Sports	P.Srilatha/B.Ashwini
			CO-CU/DAA	Co-Curricular/Dept. Assoc.Activities	S.Alekhya/S.Naresh/K.Bhaskar Reddy
			LIB	Library	G.Nirmala/A.Savetha

Class Incharge | Head of The Department | Principal

Head of the Department
Electronics and Communication Engg. Dept
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LESSONPLAN

Programme:B.Tech	AcademicYear:2022-23
Year: III	Semester:II
Course Title: EMBEDDED SYSTEM DESIGN	CourseCode:EC613PE
NameofFaculty:A.VAANI	

Unit-I Syllabus

Introduction toEmbedded Systems: Definition of Embedded System,Embedded SystemsVsGeneralComputingSystems,HistoryofEmbeddedSystems,Classification,MajorApplication Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes ofEmbeddedSystems.

.

No.ofSessions Planned	Topics	Reference	Teaching Method/ Aids
1	DefinitionofEmbedded Systems	T1,R1	BB
1	EmbeddedSystems/Generalcomputingsystems	T1	BB
1	HistoryofEmbeddedsystems	T1,R1	BB
2	Classification	T1,R1	BB,PPT
2	Majorapplicationsareas	T1	BB
1	PurposeofEmbeddedsystems	T1,R1	BB
2	Characteristicsand qualityattributesofembedded systems	T1	BB
Gap beyondsyllabus(ifany):			
Gapwithinthesyllabus(ifany)			
CourseOutcome1:Describethebasicsofanembeddedsystem. .			

*SessionDuration:50minutes

*TotalNumberofHours/Unit:10

Unit-II Syllabus

Typical Embedded System: Core of the Embedded System: General Purpose and DomainSpecific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and ExternalCommunicationInterfaces.

No.of Sessions Planned	Topics	Reference	Teaching Method/ Aids
1	Coreofthe Embedded Systems	T1	BB
1	GeneralpurposeandDomainspecificprocessors	T1, R1	BB
1	ASIC'S	T1	BB
1	PLD'S	T1,R 1	BB
1	CommercialOfftheshelfcomponents(COTS)	T1	BB
1	Memory:ROM,RAM	T1,R1	BB,PPT
1	Memoryaccordingtothe typeofInterface	T1	BB
1	Memoryshadowing	T1	BB
1	MemoryselectionforEmbeddedsystems	T1,R1	BB
1	SensorsandActuators	T1, R2	BB
2	CommunicationInterface:Onboardand External communicationinterface	T1, R1	BB,PPT
Gapbeyondsyllabus(ifany):			
Gap withinthesyllabus(ifany)			
CourseOutcome1: Interpret thetypeofmemoryandinterfacingtoexternalworld			

*SessionDuration:50minutes

*TotalNumberofHours/Unit:12

Unit-IVSyllabus

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

No.ofSessions Planned	Topics	**Reference**	**Teaching Method/ Aids**
3	Ope rating System Basics	T1	BB
1	Types of operating Systems	T1, R1	BB
2	Tasks, Process, and Threads	T1, R1	BB
1	Multi-processing and Multitasking	T1, R3	BB
3	Task scheduling	T1, R2	BB, PPT
Gap beyond syllabus (if any):			
Gap within the syllabus (if any)			
CourseOutcome1: Express the task communication/synchronization issues			

*SessionDuration:50minutes

*Total Number of Hours/Unit:10

Unit-V Syllabus

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, Methods to Choose a n RTOS.

No. of Sessions Planned	Topics	Reference	Teaching Method/ Aids
1	Shared Memory	T1, R1	BB
2	Message passing	T1, R1	BB
1	Remote procedure call and Sockets	T1, R1	BB
1	Task synchronization.	T1	BB
2	Task Communication/Synchronization issues	T1, R3	BB, PPT
2	Task synchronization Techniques	T1, R1	BB
1	Device drivers.	T1, R3	BB
2	How to choose an RTOS	T1, R1	BB
Gap beyond syllabus (If any):			
Gap within the syllabus (if any)			
CourseOutcome1: Asses the method of designing an embedded system for any type of application			

*SessionDuration:50minutes

*Total Number of Hours/Unit:12

TEXTBOOKS:

T1. Introduction to Embedded Systems- Shibu K.V, McGraw-Hill.

REFERENCEBOOKS:

R1. Embedded Systems-Raj Kamal, MH.
R2. Embedded System Design-Frank Vahid, TonyGivargis, JohnWiley.
R3. Embedded Systems–Lyla, Pearson,2013
R4. An Embedded Software Primer-David E.Simon,PearsonEducation

WEBREFERENCES:

W-1. Real Time Applications of Embedded Systems-Elprocus

W-2. Peripheral Devices-java t point

W-3. https://iqramali.medium.com/role-of-rtc-real-time-clock-in-embedded-devices-35dbd2e8f9e7

W-4. Difference Between Sensors and Actuators (with Comparison Chart) -Tech Differences

W-5 https://www.tutorialspoint.com/operating_system/index.htm

Lecture notes

Unit 1 link:
https://drive.google.com/file/d/1nUlFO4Cqzgo2zz0_SFSN8mEWi1XnlouD/view?usp=drive_link

Unit 2 link:
https://drive.google.com/file/d/1FSyMyp4h6ZuyPWhCYPQrquJzaSgMSiGT/view?usp=drive_link

Unit 3 link:
https://drive.google.com/file/d/1xIAtJZuKkXuw9CBlD4aZmWyNhkS5qaiN/view?usp=drive_link

Unit 4 link:
https://drive.google.com/file/d/1iGpre70lhEHXCI1Bv7dMziT-wZqsGtM/view?usp=drive_link

Unit 5 link:
https://drive.google.com/file/d/1nXT4OLmeiUmcC7fm1n0xzJjdWmMnjq_m/view?usp=drive_link

Power point presentation

PPT link:

https://drive.google.com/file/d/1viOmtEg7R4umffv7LGO7G9pMA3l97q8j/view?usp=sharing

Code No: 156AV **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, February - 2023
EMBEDDED SYSTEM DESIGN
(Electronics and Communication Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.	a)	What is fourth generation embedded system? Give an example.	[2]
	b)	Mention the significance of prototype development.	[3]
	c)	List the components of a typical embedded system.	[2]
	d)	What is memory shadowing? What is the advantage of it?	[3]
	e)	What is the difference between static and global functions?	[2]
	f)	Mention the advantages of assembly language based ES firmware.	[3]
	g)	List different types of operating systems.	[2]
	h)	Write about preemptive scheduling.	[3]
	i)	Differentiate between stream sockets and datagram sockets.	[2]
	j)	Write about message queue.	[3]

PART – B

(50 Marks)

2.		Illustrate the various purposes of embedded system with relevant examples.	[10]
		OR	
3.	a)	What is non-operational quality attribute? Discuss the important non-operational quality attributes examined in any design of embedded systems.	
	b)	Explain the different classification of embedded systems by giving example for each.	[5+5]
4.	a)	What is the significance of onboard communication interface? Explain the difference between I^2C and SPI communication interface.	
	b)	Expand the terms RISC and CISC. Compare RISC vs CISC processor.	[5+5]
		OR	
5.	a)	Discuss the classification of working memory with implementation sketches.	
	b)	Write a short notes on ASICs and COTs by citing their drawbacks.	[5+5]

6. a) Explain the role of Watchdog timer in embedded system.
   b) What is the difference between 'Super loop' based and 'OS' based embedded firmware design? Which one is the better approach? [5+5]

OR

7. a) What is Interrupt Vector Address and Interrupt Service Routine (ISR)? How are they related?
   b) What is function pointer? Explain the use of function pointers. [5+5]

8. a) What are the differences between multitasking and multiprocessing? Explain.
   b) Give a detail structure of task and a process. [5+5]

OR

9. Discuss the basic functions performed by a Real-Time kernel. [10]

10. a) What is priority inversion? What are the different techniques adopted for handling priority inversion?
    b) Explain the architecture of device drivers. [5+5]

OR

11. Describe different functional and non-functional requirements needed in the selection of RTOS. [10]

---ooOoo---

Code No: 156AV **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, August - 2022
EMBEDDED SYSTEM DESIGN
(Electronics and Communication Engineering)

Time: 3 Hours **Max.Marks:75**

Answer any five questions
All questions carry equal marks
- - -

1.a) Define an embedded system. Explain the characteristics of Embedded Systems.
b) List out the major application areas of embedded systems. [7+8]

2.a) Distinguish about portability and reliability in embedded system design.
b) What are the various purposes of embedded systems with illustrative examples? [8+7]

3.a) Explain the role of sensors in embedded system design.
b) What are the different factors that needs to be considered in the selection of memory for embedded systems? [7+8]

4.a) Illustrate the differences between general purpose and domain specific processors.
b) Discuss about on-board communication interfaces in brief. [8+7]

5.a) What is the need of an embedded firmware? Discuss.
b) Narrate about the embedded firmware development languages. [7+8]

6.a) Explain the functions of Watchdog timer in an embedded system.
b) Describe the purpose of a Real Time Clock in an embedded system, and explain. [8+7]

7.a) How different thread binding models, used for user and kernel level threads?
b) Define starvation in the process of scheduling context. Explain how starvation can be effectively tackled? [8+7]

8.a) How the concept of Shared memory is used in task communication?
b) Explain message-passing communication system in detail. [8+7]

---oo0oo---

Code No: 156AV **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, February/March - 2022
EMBEDDED SYSTEM DESIGN
(Electronics and Communication Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.	Explain the different classification of embedded systems with an example.	[15]
2.a)	What are the operational attributes of an embedded system? Explain.	
b)	What are the different present technologies used in embedded systems.	[10+5]
3.a)	Differentiate Harvard and Von-Neumann architectures.	
b)	What are the advantages of PLDs over fixed logic devices? Explain.	[8+7]
4.a)	Classify the program storage memory and explain.	
b)	Explain the different external communication interfaces in brief.	[8+7]
5.	Explain the advantages and drawbacks of Assembly language based embedded firmware development.	[15]
6.a)	Explain the embedded firmware design.	
b)	Explain the following: (i) Brown-out protection circuit (ii) Real-time clock	[8+7]
7.a)	Differentiate process and thread. Write some examples.	
b)	What are the different types of multitasking? Explain.	[8+7]
8.a)	What are the different conditions favoring a deadlock situation? Explain.	
b)	Explain the role of device driver in embedded OS based products.	[8+7]

---ooOoo---

Code No: 156AV **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, August/September - 2021
EMBEDDED SYSTEM DESIGN
(Electronics and Communication Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) Describe the general characteristics of embedded systems in detail.
b) Relate the Application Specific Embedded system with an example. [7+8]

2.a) Narrate various purposes of embedded systems with illustrative examples.
b) What are different current technologies used for embedded system design? Explain briefly. [8+7]

3.a) What are different types of memories used in embedded systems? Explain with examples.
b) Explain the different on-board communication interfaces in brief. [8+7]

4.a) With a neat diagram, explain the architecture of a general purpose processor.
b) Explain about ASICs, PLDs and COTs. [8+7]

5.a) Justify the need of brown out protection circuit in Embedded systems.
b) Discuss the significance of Watchdog timer in an Embedded System. [7+8]

6.a) What is the need of an embedded firmware? Briefly explain the embedded firmware development languages.
b) Write a short note on Real Time Clock. [10+5]

7.a) What is task scheduling? Explain Round Rabin scheduling algorithm.
b) What is a process? With a neat representation explain the process states and state transition. [7+8]

8.a) Explain message passing technique for inter process communication in detail.
b) Explain how semaphores are used for task synchronization. [8+7]

---ooOoo---

Sri Indu Institute of Engineering & Technology

Sheriguda (V), Ibrahimpatnam (M), R.R.Dist-501 510

I - Mid Examinations, MAY -2023

Set -I

Year & Branch: **III –ECE (A, B)** **Date: 09/05/23(AN)**

Subject: **ESD** Max. Marks: 10 Time: 60 mins

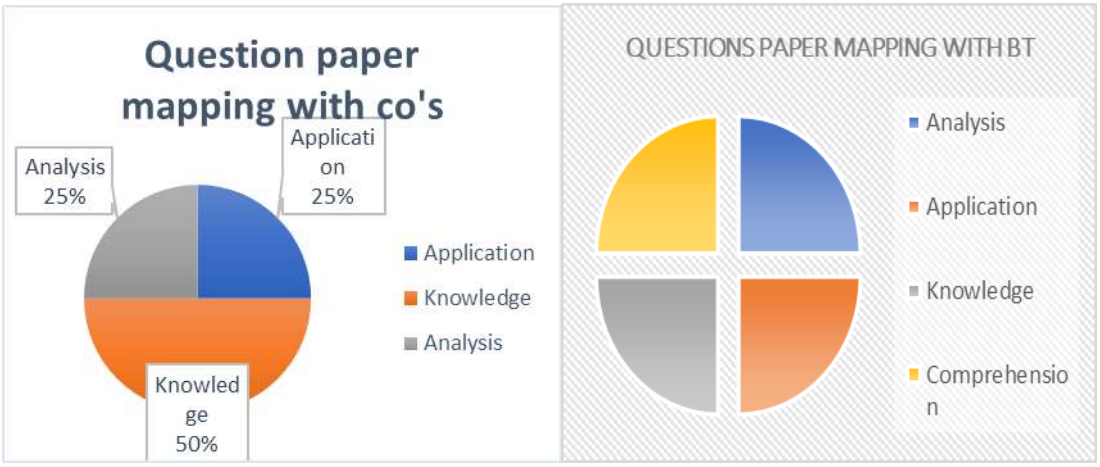
Answer any **TWO** Questions. All Question Carry Equal Marks 2*5=10 marks

1.Write about the Brown-Out protection circuit and explain about Realtime clock. (5M) (C324.3)(Knowledge)

2) Explain the different On-board communication interfaces in brief. (5M) (C324.2) (Application)

3) Discuss about various application area of embedded system and give example for each application area. (5M) (C324.1) (Knowledge)

4)Whatarethedifferent types of Memories used in Embedded system designed explain each role in detail. (5M) (C324.2) (Analysis)



Sri Indu Institute of Engineering & Technology

Sheriguda (V), Ibrahimpatnam (M), R.R.Dist-501 510

II - Mid Examinations, JUNE -2023

Set -I

Year & Branch: **III –ECE (A,B)** **Date: 27/06/23(AN)**

Subject: **ESD** Max. Marks: 10 Time: 60 mins

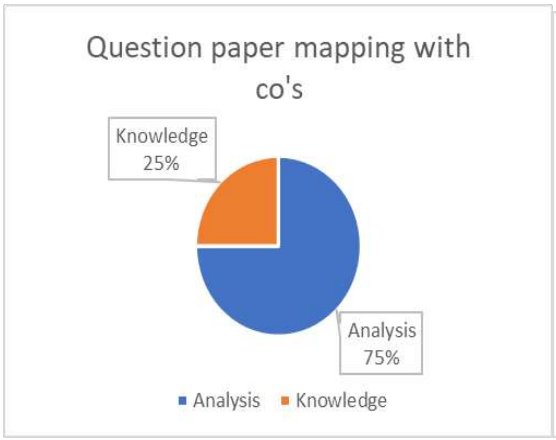
Answer any **TWO** Questions. All Question Carry Equal Marks 2*5=10 marks

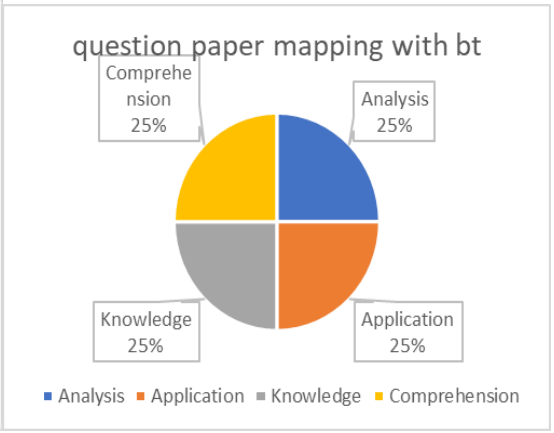
1) Explain about the embedded firmware design approaches and embedded firmware development languages (5M) (C324.3) (**Analysis**).

2) What is a process? With a neat representation explain the process states and state transition. (5M) (C324.3) (**Knowledge**)

3) Explain message passing technique for inter process communication in detail. (5M) (C324.5) (**Analysis**)

4). Explain about the different types of multi-tasking models in the OS context (5M) (C324.4) (**Analysis**).





Sri Indu Institute of Engineering & Technology

Sheriguda (V), Ibrahimpatnam (M), R.R.Dist-501 510

B-Tech I - Mid Examinations, MAY-2023

Objective Type Exam

Year &Branch: III –ECE-A, B&C **Date: 09-05-2023(AN)**

Subject: ESD Max. Marks: 10 Time: 20 mins

Name: ……..Roll No……

I. Choose the correct alternative:

1. The first recognized modern embedded system is ( )

a) Apple computer b) Apollo guidance computer

c)Calculator d) Radio navigation system

2. Which of the following is not an example of small-scale embedded system?

a) Electronic Barbie doll b) simple calculator ( )

c)cellphone d) electronic toy car

3. Whichofthefollowingistheexampleoffourthgenerationembeddedsystem?

a) smart phone devices b) electronic toy car ( )

c) simple calculator d) SCADA device

4. A digital multimeter is an example of embedded system for ( )

a) data communication b)monitoring) control d)none of these

5 Whichof the following is an example of embedded system

For data communication. ( )

a) music player b) network router

c) digital camera d) none of these

6. Which of the following is an example of on-board communication interface.

a) I2C b) SPI c) UART d) all of these

( )

7. Which of the following is an example of external communication interface?

a) Bluetooth b) wi-fi c) GPRS d) all of these ( )

8. Serial Peripheral Interface supports the ( )

a) half duplex synchronous protocol b) full duplex synchronous protocol c) both a and b d) none of these

9. What is the work of oscillator unit in embedded system. ( )

a) Reference for time b) Reset the circuit

c)generate clock pulses d) none of these

10. Brown-out protection circuit turn off the system when the voltage of the

Embedded system is……. ( )

a) Below the specified level b) above the specified level

c)both a and b d) none of these

I. Fill In the Blanks:

11. Embedded system is a combination of both_____and_____.

12. First generation embedded systems built around_____bit microprocessor.

13. Expand the ASIC

14. Watch dog timer is used to_____system if the system gets stuck somewhere in middle of the program.

15Whatis thefullformofI2C_____

16. What is the full form of UART_____

17. GPRS is a packet oriented_____serviceon2G &3Gcellularsystems.

18. ROMis_____type of memory.

19. Expand the EEPROM____

20. Firm ware is also called as_____

Sri Indu Institute of Engineering & Technology

Sheriguda (V), Ibrahimpatnam (M), R.R.Dist-501 510

B-Tech II - Mid Examinations, June-2023

Objective Type Exam

Year &Branch: III –ECE-A, B **Date: 27-06-2023(AN)**

Subject: ESD Max. Marks: 10 Time: 20 mins

Name: ……..Roll No……..

I. Choose the correct alternative:

1. Translation of assembly code to machine code is performed by the
a) assembler b) compiler c) linker d) locater ( )

2. Assembly language is the human read able notation of?
a) Machine language b) high level language ( )
c)both a and b d) none of these

3. Interrupt which occur in sync with the currently executing task are known as?( )

a) asynchronous interrupts b) synchronous interrupts
c)external interrupts d) none of these

4.Aprocesshas. ( )
a) stack memory b) program memory c) data memory d) All of these

5.Whatarethedifferenttypesofmultitaskingpresentinoperatingsystem. ( )
a) co-operative b) preemptive
c)non-emptive d) all of these

6. Who determines which task/process is to execute data given point of time. ( )
a) Context paper c) scheduler d) none of these.

7. Which of the following techniques issued by operating systems for inter process ( )
communication?
a)shared memory b)messaging c)signaling d)all of these

8)Which among the following techniques isused for sharing data between process( )

a) semaphoresb) shared memory c) messages d) both b and c

8. Which among the following is a shared memory technique for IPC. ( )

a)pipes b) memory mapped object c)message blocksd) both a and b

9. Process/Task synchronization is essential for. ( )

a) avoiding conflicts in resource access in multi-tasking environment
b)ensuring proper sequence of operation across processes

c)communicating between processes d)all of these

I. FillInTheBlanks:

10. Translation of assembly code to machine code is performed by_____.

11.Super loop based approach require an operating system(yes or no)_____.

13.A process can have any threads of execution(True or False) _

14.The ability of a system to execute multiple processes simultaneously is known as_____.

15.Missing deadline for tasks are acceptable in_____ real time systems.

16.For a good scheduling algorithm the CPU utilization is_____

17.Shared memory techniques for IPC are_____and_____.

18In which a process does not get the CPU or system resources required to continue its execution for a long time is called as_____

19is a piece of software that acts as a bridge between the operating system and hardware.

20.IPC full form_____.

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B-Tech I - Mid Examinations, MAY-2023

Year &Branch: III –ECE-A, B&C **Date: 09-05-2023(AN)**

Subject: ESD

ANSWER KEY

Descriptive paper key link:

https://drive.google.com/file/d/1zXaKtgVMADpPcKxgLhVnSRD9KDJ_cKLE/view?usp=sharing

Objective Key Paper

I.Choose the correct alternative:

1.a

2.c

3.a

4.c

5.c

6.d

7.d

8.b

9.c

10.c

Fill in the blanks:

11. S/wand H/w
12. 8bits
13. Yes
14. Applicationspecificintegratedcircuit.
15. InterIntegratedCircuitBus.
16. UniversalAsynchronousreceiverandtransmitter.
17. Wirelessdatacommunication.
18. Non-volatilenature.
19. electricallyerasableprogramreadonlymemory.
20. software.

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B-Tech II - Mid Examinations, June-2023

Year &Branch: III –ECE-A, B **Date: 27-06-2023(AN)**

Subject: ESD

ANSWER KEY

Descriptive paper key link:

https://drive.google.com/file/d/1K11g0OZ9g9GZoqgBIDhvOycO_B33naio/view?usp=sharing

Objective Key Paper

I. Choose the correct alternative:

1.a

2.b.

3.d

4.b

5.b

6.c

7.d

8.d

9.b

10.a

Fill in the blanks:

11. Assembler
12. No
13. Yes
14. Multitasking
15. Realtimesystem
16. Scheduling-0-100
17. memorysharedbetweentwoor moreprocessors
18. Schedulingforoperatingsystem
19. kernel
20. Inter process communication

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Khalsa Ibrahimpatnam, Sheriguda (V), Ibrahimpatnam (M), Ranga Reddy Dist., Telangana – 501 510
Website: https://siiet.ac.in/

ASSIGNMENT- 1 **SUBJECT: ESD**

1)Write about the Brown-Out protection circuit and explain about Real time clock. (C324.3) (Knowledge)

2) Explain the different On-board communication interfaces in brief. (C324.2) (Application)

3) Discuss about the various applications on area of embedded system and give the examples of an application area. (C324.1) (Knowledge)

4) What are the different types of memories used in embedded system and explain in details (C324.2) (Analysis)

5) Difference between general computing system and embedded system. (C324.1) (Analysis)

6) Difference between SRAM and DRAM. (C324.2) (Analysis)

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ASSIGNMENT- 2 **SUBJECT: ESD**

1) Explain about the embedded firmware design approaches and embedded firmware development languages. (C324.3) (Analysis)

2)What is a process? With a neat diagram explain about the process state and state transition. (C324.3) (Knowledge)

3)Explain the message passing technique for inter process communication in detail. (C324.5) (Analysis)

4)Explain about the different multitasking models in the OS context. (C324.4) (Analysis.)

5) Explain about the device drivers (C324.3) (Analysis)

CourseTitle	Embedded system design (professional elective-II)
CourseCode	EC613PE
Programme	B.Tech
Year&Semester	IIIyearI-semester, Asec
Regulation	R18
CourseFaculty	A.VAANI,AssistantProfessor,ECE

Slowlearners:

SNo	Rollno	Noofbacklogs	Internal-IStatus	Internal-IIStatus
1	20X31A0401	4	21	21
2	20X31A0403	5	14	14
3	20X31A0406	4	21	22
4	20X31A0407	3	20	20
5	20X31A0408	3	19	20
6	20X31A0410	5	14	14
7	20X31A0411	4	24	24
8	20X31A0412	5	19	14
9	20X31A0413	4	22	22
10	20X31A0418	8	14	14
11	20X31A0419	4	21	21
12	20X31A0423	3	22	22
13	20X31A0427	3	20	21
14	20X31A0428	4	20	21
15	20X31A0430	4	24	24
16	20X31A0431	5	21	21
17	20X31A0433	3	14	22
18	20X31A0435	3	22	22
19	20X31A0436	5	19	20

20	20X31A0440	4	23	22
22	20X31A0445	4	24	22
23	20X31A0447	3	24	23
24	20X31A0450	4	23	23
25	20X31A0453	4	24	22
26	20X31A0454	5	14	14
27	20X31A0455	4	21	18
28	20X31A0456	5	22	14
30	20X31A0458	3	22	22
31	20X31A0462	3	21	22

Advancedlearners:

S.NO	ROLL.NO.	SeminarTopics
1	20X31A0404	1.EmbeddedSystems. 2.Purpose ofEmbedded Systems. 3.Coreof theEmbedded System. 4.DomainSpecific Processors. 5.ASICs, PLDs, Commercial Off-The-ShelfComponents (COTS). 6.Onboardand External CommunicationInterfaces. 7.Brown-out Protection Circuit. 8.Embedded Firm ware Design Approaches. 9.OperatingSystemBasics. 10.Multiprocessingand Multitasking. 11.Remote ProcedureCall and Sockets. 12. TaskSynchronization. 13. MethodstoChoose an RTOS.
2	20X31A0409	
3	20X31A0415	
4	20X31A0416	
5	20X31A0420	
6	20X31A0421	
7	20X31A0422	
8	20X31A0425	
9	20X31A0432	
10	20X31A0434	
11	20X31A0437	
12	20X31A0438	
13	20X31A0439	
14	20X31A0442	
15	20X31A0444	
16	20X31A0449	

17	20X31A0452	
18	20X31A0459	
19	20X31A0459	

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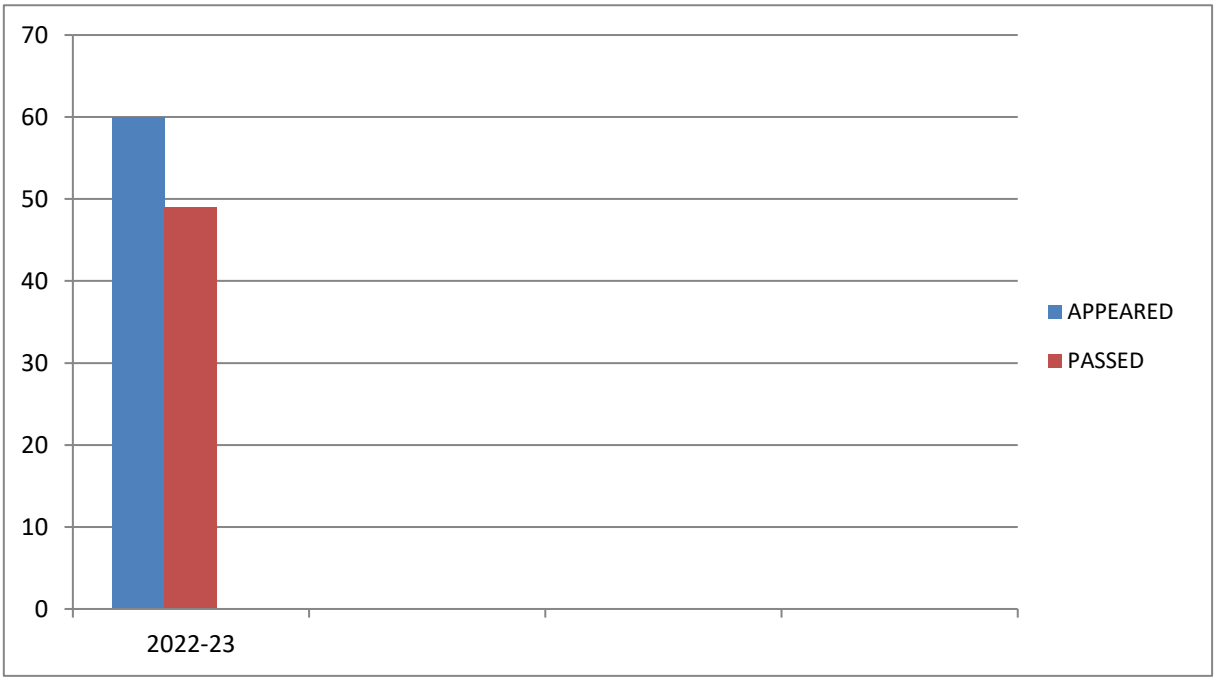
BATCH ECE-III BTECH II SEM ECE-A RESULT ANALYSIS

ACADAMIC YEAR	COURSE NAME	NUMBER OF STUDENTS		QUESTION PAPER SETTING		PASS%
		APPEARED	PASSED	INTERNAL	EXTERNAL	
2022-23	EMBEDDED SYSTEM DESIGN	60	49	COURSE FACULTY	JNTUH	81.16

EMBEDDED SYSTEM DESIGN (C324) RESULT ANALYSIS



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

REMEDIAL CLASSES TIME TABLE

A.Y 2022-23 **SEMESTER-II**

BRANCH/ SEC	MON 4.00 PM- 5.00 PM	TUE 4.00 PM- 5.00 PM	WED 4.00 PM- 5.00 PM	THUR 4.00 PM- 5.00 PM	FRI 4.00 PM- 5.00 PM
II ECE-A	EMF&W	LTNM	A&DC	LICA	ECA
II ECE-B	LICA	A&DC	EMF&W	ECA	LTNM
III ECE-A	DSP	VLSID	A&P	ESD	IM
III ECE-B	A&P	ESD	DSP	IM	VLSID
III ECE-C	IM	A&P	ESD	VLSID	DSP
IV ECE-A	WSN	ML	LPVLSID	-	-
IV ECE-B	ML	LPVLSID	WSN	-	-
IV ECE-C	LPVLSID	WSN	ML	-	-

HOD
Head of the Department
Electronics and Communication Engg. Dept
SRI INDU INSTITUTE OF ENGG & TECH
Sheriguda(V), Ibrahimpatnam(M), R.R.Dist-501 510.

PRINCIPAL
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Sri Indu Institute of Engineering & Tech
Sheriguda(Vill), Ibrahimpatnam
R R Dist Telangana -501 510

ASSIGNMENTS AND REGISTERS

Assignment 1 script link:

https://drive.google.com/file/d/17auxtQB00K7Obr8ULH7w9eLJ3fRpsB7t/view?usp=sharing

Assignment 2 script link:

https://drive.google.com/file/d/1hvNfBQOwhNhxvKd5ytZS7dGCYgs7YM1n/view?usp=sharing

Attendance register link:

https://drive.google.com/file/d/1pQNLwrmlhUMpVDqUyhlcbsr06LUsHDjN/view?usp=sharing

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication Engineering

Course Outcome Attainment (Internal Examination-1)

Name of the faculty : A.VAANI | Academic Year: 2022-2023

Branch & Section: ECE - A | Examination: I Internal

Course Name: ESD | Year: III | Semester: II

S.No	HT No.	Q1a	Q1b	Q2a	Q2b	Q3a	Q3b	Q4a	Q4b	Obj	A
Max. Marks ==>		5		5		5		5		10	5
1	20X31A0401	5		2						9	5
2	20X31A0402	3		4						9	5
3	20X31A0403					2		2		5	5
4	20X31A0404	3				5				9	5
5	20X31A0405			5		4				9	5
6	20X31A0406			4		4				8	5
7	20X31A0407			4		3				8	5
8	20X31A0408			3		3				8	5
9	20X31A0409	5		5						10	5
10	20X31A0410	2						2		5	5
11	20X31A0411					5		5		9	5
12	20X31A0412			3		3				8	5
13	20X31A0413			4		4				9	5
14	20X31A0414	5				5				9	5
15	20X31A0415	5						5		9	5
16	20X31A0416					4		4		8	5
17	20X31A0417	5		5						9	5
18	20X31A0418	2						2		5	5
19	20X31A0419			4		4				8	5
20	20X31A0420			4		3				8	5
21	20X31A0421			4		4				8	5
22	20X31A0422	4		4						9	5
23	20X31A0423			4		4				9	5
24	20X31A0424			4		4				8	5
25	20X31A0425			5		4				8	5
26	20X31A0426			5		5				8	5
27	20X31A0427			3		4				8	5
28	20X31A0428			3		4				8	5
29	20X31A0429			4		4				8	5
30	20X31A0430	5				5				9	5
31	20X31A0431	4		4						8	5
32	20X31A0432	5		5						9	5
33	20X31A0433					4		4		9	5
34	20X31A0434			5		5				9	5
35	20X31A0435			4		4				8	5
36	20X31A0436			3		3				8	5
37	20X31A0437			5				5		8	5
38	20X31A0438	5		5						9	5
39	20X31A0439			5		5				9	5
40	20X31A0440			5		4				9	5

41	20X31A0441			4				5		8	5
42	20X31A0442			5		5				9	5
44	20X31A0444	5				5				8	5
45	20X31A0445	5		5						9	5
46	20X31A0446					5		5		9	5
47	20X31A0447	5		5						9	5
48	20X31A0448					4		5		8	5
49	20X31A0449	5		5						9	5
50	20X31A0450			5		4				9	5
51	20X31A0451			5		5				9	5
52	20X31A0452	5				5				9	5
53	20X31A0453	5				5				9	5
54	20X31A0454	2						2		5	5
55	20X31A0455			5		4				7	5
56	20X31A0456			4		4				9	5
58	20X31A0458			4		5				8	5
59	20X31A0459			5				5		9	5
60	20X31A0460			4		4				8	5
61	20X31A0461	5				5				9	5
62	20X31A0462			4		4				8	5
Target set by the faculty		3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	6.00	3.00
Number of students		19	0	42	0	41	0	9	0	56	60
Number of students attempted		22	0	43	0	42	0	13	0	60	60
Percentage of students scored more than target		86%		98%		98%		69%		93%	100%

CO Mapping with Exam Questions:

CO - 1	Y						Y		Y	Y
CO - 2			Y						Y	Y
CO - 3					Y				Y	Y
CO - 4										
CO - 5										
CO - 6										

% Students Scored	86%		98%		98%		69%		93%	100%

CO Attainment based on Exam Questions:

CO - 1	86%						69%		93%	100%
CO - 2			86%						93%	100%
CO - 3					98%				93%	100%
CO - 4										
CO - 5										
CO - 6										

CO	**Subj**	obj	Asgn	Overall	Level
CO-1	78%	93%	100%	90%	3.00
CO-2	86%	93%	100%	93%	3.00

Attainment Level		
1	40%	
2	50%	

CO-3	98%	93%	100%	97%	3.00
CO-4					
CO-5					
CO-6					

3	60%	

Attainment (Internal 1 Examination) = **3.00**

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication Engineering

Course Outcome Attainment (Internal Examination-1)

Name of the faculty : A.VAANI Academic Year: 2022-2023

Branch & Section: ECE - A Examination: II Internal

Course Name: ESD Year: III Semester: II

S.No	HT No.	Q1a	Q1b	Q2a	Q2b	Q3a	Q3b	Q4a	Q4b	Obj4	A
Max. Marks ==>		5		5		5		5		10	5
1	20X31A0401			4		4				8	5
2	20X31A0402			5		4				9	5
3	20X31A0403	2						2		5	5
4	20X31A0404			5		4				8	5
5	20X31A0405			4		5				8	5
6	20X31A0406			4		5				8	5
7	20X31A0407			4		4				7	5
8	20X31A0408			4		4				7	5
9	20X31A0409			5		5				9	5
10	20X31A0410			5						4	5
11	20X31A0411			5		5				9	5
12	20X31A0412					5				4	5
13	20X31A0413			4		4				9	5
14	20X31A0414			5		5				9	5
15	20X31A0415			5		5				9	5
16	20X31A0416			4		4				8	5
17	20X31A0417			5		5				9	5
19	20X31A0418							5		4	5
20	20X31A0419			4		4				8	5
21	20X31A0420			3		4				8	5
22	20X31A0421			4		4				8	5
23	20X31A0422			5		4				8	5
24	20X31A0423			5		4				8	5
25	20X31A0424			4		5				8	5
26	20X31A0425			5		5				8	5
27	20X31A0426			4		5				8	5
28	20X31A0427			4		4				8	5
29	20X31A0428			4		5				7	5
30	20X31A0429			3		5				8	5
31	20X31A0430			5		5				9	5
32	20X31A0431			3		5				8	5
33	20X31A0432			5		5				9	5
34	20X31A0433	4								5	5
35	20X31A0434			5		5				9	5
36	20X31A0435			3		5				9	5
37	20X31A0436			4		4				7	5
38	20X31A0437			5		5				9	5
39	20X31A0438			5		5				9	5
40	20X31A0439			5		5				9	5
41	20X31A0440			4		5				8	5
42	20X31A0441			5		4				9	5
43	20X31A0442			5		5				9	5
44	20X31A0444			5		5				9	5
45	20X31A0445			4		5				8	5

46	20X31A0446			4		5				9	5
47	20X31A0447			5		4				9	5
48	20X31A0448			5		4				8	5
49	20X31A0449			5		5				9	5
50	20X31A0450			5		4				9	5
51	20X31A0451			5		5				9	5
52	20X31A0452			5		5				9	5
53	20X31A0453			5		4				8	5
54	20X31A0454	2						2		5	5
55	20X31A0455					5				8	5
56	20X31A0456					4				5	5
57	20X31A0458			5		4				8	5
58	20X31A0459			5		5				9	5
59	20X31A0460			4		4				8	5
60	20X31A0461			5		5				9	5
61	20X31A0462			5		4				8	5
Target set by the faculty /			0.00	3.00	0.00	3.00	0.00	3.00	0.00	6.00	3.00
performed above the target		3.00	0	53	0	55	0	1	0	53	60
Number of students attempted		1	0	53	0	55	0	3	0	60	60
Percentage of students scored more than target		3		100%		100%		33%		88%	100%

CO Mapping with Exam 33%

CO - 1										
CO - 2										
CO - 3										
CO - 4							Y		Y	Y
CO - 5	Y		Y						Y	Y
CO - 6					Y				Y	Y
% Students Scored			100%		100%		33%		88%	100%

CO Attainment based on 33%

CO - 1										
CO - 2										
CO - 3										
CO - 4							33%		88%	100%
CO - 5	33%		100%						88%	100%
CO - 6					100%				88%	100%

CO		obj	Asgn	Overall	Level
CO-1	**Subj**				
CO-2					
CO-3					
CO-4		88%	100%	94%	3.00
CO-5	33%	88%	100%	74%	3.00
CO-6	67%	88%	100%	85%	3.00
Attainment (	100%				**3.00**

Attainment Level

1	40%
2	50%
3	60%

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication Engineering

Course Outcome Attainment (University Examinations)

Name of the faculty : A.VAANI A.Y: 2022-2023

Branch & Section: ECE - A Year / Semester: III-II

Course Name: ESD

S.No	Roll Number	Marks Secured
1	20X31A0401	42
2	20X31A0402	35
3	20X31A0403	-1
4	20X31A0404	51
5	20X31A0405	41
6	20X31A0406	41
7	20X31A0407	40
8	20X31A0408	30
9	20X31A0409	41
10	20X31A0410	10
11	20X31A0411	28
12	20X31A0412	1
13	20X31A0413	27
14	20X31A0414	43
15	20X31A0415	48
16	20X31A0416	20
17	20X31A0417	40
18	20X31A0418	-1

S.No	Roll Number	Marks Secured
36	20X31A0436	9
37	20X31A0437	29
38	20X31A0438	36
39	20X31A0439	44
40	20X31A0440	26
41	20X31A0441	26
42	20X31A0442	47
43	20X31A0444	40
44	20X31A0445	15
45	20X31A0446	26
46	20X31A0447	29
47	20X31A0448	26
48	20X31A0449	36
49	20X31A0450	9
50	20X31A0451	34
51	20X31A0452	42
52	20X31A0453	30
53	20X31A0454	-1

19	20X31A0419	33
20	20X31A0420	32
21	20X31A0421	39
22	20X31A0422	44
23	20X31A0423	11
24	20X31A0424	35
25	20X31A0425	42
26	20X31A0426	33
27	20X31A0427	31
28	20X31A0428	36
29	20X31A0429	35
30	20X31A0430	27
31	20X31A0431	18
32	20X31A0432	35
33	20X31A0433	21
34	20X31A0434	46
35	20X31A0435	27
Max Marks		75

54	20X31A0455	36
55	20X31A0456	26
56	20X31A0458	31
57	20X31A0459	46
58	20X31A0460	32
59	20X31A0461	34
60	20X31A0462	42

Class Average mark	31
Number of students performed above the target	35
Number of successful students	60
Percentage of students scored more than target	58%
Attainment level	**2**

Attainment Level	
1	40%
2	50%
3	60%

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication Engineering

Course Outcome Attainment

Name of the faculty : A.VAANI
Academic Year: 2022-2023
Branch & Section: ECE - A
Year: III
Course Name: ESD
Semester: II

Course Outcomes	1st Internal Exam	2nd Internal Exam	Internal Exam	University Exam	Attainment Level
CO1	3.00		3.00	2.00	2.25
CO2	3.00		3.00	2.00	2.25
CO3	3.00		3.00	2.00	2.25
CO4		3.00	3.00	2.00	2.25
CO5		3.00	3.00	2.00	2.25
CO6		3.00	3.00	2.00	2.25
Internal & University Attainment:			3.00	2.00	
Weightage			25%	75%	
CO Attainment for the course (Internal, University)			0.75	1.50	
CO Attainment for the course (Direct Method)			2.25		

Overall course attainment level **2.25**

SRI INDU INSTITUTE OF ENGINEERING & TECHNOLOGY

Department of Electronics and Communication Engineering

Program Outcome Attainment (from Course)

Name of Faculty:	A.VAANI	Academic Year:	2022-2023
Branch & Section:	ECE - A	Year:	III
Course Name:	ESD	Semester:	II

CO-PO mapping

PO /CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C324.1	2	-	2	-	-	-	-	-	-	-	-	-	3	2
C324.2	2	-	3	-	-	-	-	-	-	-	2	-	2	3
C324.3	2	-	2	-	-	-	-	-	-	-	-	2	3	2
C324.4	3	-	3	-	-	-	-	-	-	-	3	-	2	3
C324.5	2	-	2	-	-	-	-	-	-	-	-	2	2	3
C324.6	2	-	3	-	-	-	-	-	-	-	-	3	3	2
AVG	2.17	-	2.5	-	-	-	-	-	-	-	2.5	2.3	2.5	2.5

CO	Course Outcome Attainment
CO1	2.25
CO2	2.25
CO3	2.25
CO4	2.25
CO5	2.25
CO6	2.25
Overall course attainment level	2.25

PO-ATTAINMENT

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO Attainment	2	2	3	2							2.3	2.3	1.67	1.25

CO contribution to PO - 33%, 67%, 100% (Level 1/2/3)