GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester-V

Course Title: Software Practices
(Course Code: 4351105)

Diploma programmer in which this course is offered	Semester in which offered
Electronics & Communication Engineering	5th Semester

1. RATIONALE

It is the era of customized solutions, where fundamental knowledge of electronics and communication principles along with software support plays important role in the prototype application development. Hence the knowledge of popular industrial software helps the Electronics and Communication Engineering diploma students to maintain systems which are based on hardware and software. Programming practices will further help the students to develop indigenous hardware and software-based applications.

2. COMPETENCY

The purpose of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Develop and test models of electronic (Analog and Digital) circuits using scientific and technology support software and simulation tools.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with the identified competency are to be developed in the student for the achievement of the following COs:

a) Simulate and test mathematical and functional aspects of electronics and communication engineering principles using the basic features of software tools.
b) Develop script files for analog electronic circuits.
c) Develop different models using block-set and toolbox or functions.
d) Simulate and test analog and digital communication circuits using available functions and toolboxes.
e) Simulate and test Digital electronic circuits using available functions and toolboxes.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
0	0	2	2	0	0	25*	25	50

(*): Out of 25 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of COs and the remaining 15 marks are from viva to be taken at the end of the semester for the assessing the attainment of the cognitive domain UOs required for the attainment of the COs.

***Legends: L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit, **CA** - Continuous Assessment; **ESE** - End Semester Examination.*

5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the subcomponents of the Course Outcomes (Cos). Some of the **PrOs** marked **'*'** are compulsory, as they are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'.

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Start and exit the session SCILAB Windows: Figure, Editor and command/console window, On-line help, Input-output, File types Creating, saving and executing a script file.	I	4*
2	Perform arithmetic operations on scalar and arrays.	I	4*
3	Develop a program to obtain power delivered to receiver using Friss transmission formula.	I	2*
4	Plot and print simple plots using plot functions.	I	4*
5	Develop a program to plot waveforms: Sine, Cosine, Square, Triangle	I	2*
6	Develop a program to plot input output characteristics of diode.	II	2*
7	Develop a program to plot input output characteristics of npn Transistor.	II	2
8	Develop model for various types of rectifiers and filters.	III	2*
9	Develop a program to plot Amplitude Modulation (DSB) Waveform	IV	2*
10	Develop a program to plot Amplitude Modulation (SSB) Waveform	IV	2
11	Develop a program to plot Frequency Modulation Waveform	IV	2*
12	Develop a program to plot Low Pass, High Pass, Band Pass and Band Stop Filter design and its Frequency response using toolbox	IV	2*
13	Develop a program to plot ASK/FSK/PSK Modulation Waveform.	IV	6*
14	Develop model of Multiplexer and Demultiplexer using blockset functions.	V	2
15	Simulate AND, OR, NAND,NOR, XOR, NOT Gates using blockset functions	V	2*
16	Simulate AND, OR, NAND,NOR, XOR, NOT Gates using XCOS	V	2*
17	Simulate full adder using XCOS	V	2
18	Simulate 4 bit adder using XCOS	V	2
19	Simulate D and JK Flip-flop using XCOS	V	2
20	Perform basic Image Processing functions using Tool	I-V	2
21	Perform basic Audio Processing functions using Tool	I-V	2
22	Perform basic Video Processing functions using Tool	I-V	2
23	Perform basic matrix functions using Android Apk like ANOC,OCTAVE, MATLAB MOBILE	I-V	2

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
24	Perform basic matrix functions using Scilab on cloud.	I-V	2
			28 Hrs.

Note

i. *More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*
ii. *The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency.*

Sr. No.	Sample Performance Indicators for the PrOs	Weightage in %
1	Programming , Procedure and conduction by following safety practices.	40
2	Conceptual clarity	30
3	Interpretation of Results and Ethical values.	30
Total		**100**

5. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

This major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to use in uniformity of practical's in all institutions across the state.

Sr.No.	Equipment Name with Broad Specifications	PrO. No.
1	I3 Processor ,4GB RAM, 512GB HDD	10
2	SCILAB like software	10
3		

6. AFFECTIVE DOMAIN OUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs and PrOs. More could be added to fulfill the development of this course competency.

a. Work as a leader/a team member (while doing a micro-project).
b. Follow safety practices while using D.C. and AC supply and electrical equipment.
c. Work as a group member (while performing experiments and taking readings)
d. Practice environmentally friendly methods and processes. (Environment related)

The ADOs are best developed through the laboratory/field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

8. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy* that are formulated for development of the COs and competency. If required, more such UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
Unit – I Introduction to scientific software (like: SCILAB)	**1a**. Explore the default window basic features, commands and of the scientific and technology support software (like: MATLAB or SCILAB) environment. **1b**.Creating, saving and executing a script file. **1c**. Perform simple arithmetic operations. **1d.**Creating and perform arrays operations. **1e**. Plot the given data using various plot functions. **1f.** Creating and plotting basic signals (Sine, Cosine, Square, Triangle) .	**1.1** Default Window view Command ,Figure ,Editor window, help window **1.2** On-line help **1.3** Input-output **1.4** File types **1.5** Basic arithmetic and logical operations **1.6** Trigonometric and exponential functions operation **1.7** Plotting functions
Unit – II Analog Electronics Circuits	**2a**. Plot input output characteristics of diode. **2b**. Plot input output characteristics of npn Transistor **2c**. Simulate and test model for bias stability of transistor. **2d**. Simulate and test MOSFET equivalent circuit and plot input output characteristics. **2e**. Plot frequency response of Common Emitter Amplifier.	**2.1**Plot the characteristic curves of Linear and nonlinear analog electronic devices. **2.2** Simulate and test model /equivalent circuit of analog electronic devices. **2.3** Use of math tool for different circuits.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
Unit – III Introduction to toolbox and blockset library (like.SCILAB, XCOS)	**3a**.Creating, saving and executing a model file. 3c. **3b**. Develop model of rectifiers using blockset. **3c**. Develop model of filters using block set.	**3.1** Basic features of block set library **3.2** Sources: Voltage and current sources, power supply, RF generators, digital signal generators **3.3** Sinks: Display instruments, meters, **3.4** Various functions. **3.5** Toolbox related to electronic circuits,
Unit – IV Analog and Digital Communication	**4a**. Develop a software program to plot amplitude modulated-DSB Waveform **4b**. Develop a software program to plot amplitude modulated-SSB Waveform **4c**. Develop a software program to plot Frequency Modulation Waveform **4d**. Develop a software program to plot Phase Modulation Waveform **4e**. Develop a software program to plot Low Pass, High Pass, Band Pass and Band Stop filter design and its frequency response using toolbox **4f.**Develop a software program to plot ASK Modulation **4g**. Develop a software program to plot FSK Modulation Waveform **4h**. Develop a software program to plot PSK Modulation Waveform **4i**. Develop a software program to plot QPSK Modulation Waveform	**4.1** Mathematical equations and functions to represent of analog modulation and demodulation principles **4.2** Mathematical equations and parameters to develop analog filter circuits: Low Pass, High Pass, Band Pass and Band Stop Filter **4.3** Mathematical equations and functions to represent of digital modulation and demodulation principles
Unit – V Digital Electronics Circuits using Toolbox and Block sets	**5a**.Simulate AND, OR, NAND, NOR, XOR, NOT Gates using block sets **5b**. Develop a model of full adder and subtractor **5c**. Develop a model of multiplexer and demultiplexer. **5d**. Develop a model of D, T and JK Flip-flop. **5e**. Develop a model for a 3−bit Up / Down binary counter	**5.1** Digital circuit: basic gates, combinational and sequential circuits and their truth table, characteristic table, excitation table and waveforms.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction to scientific software	06	2	2	4	08
II	Analog Electronics Circuits	06	2	3	5	10
III	Introduction to toolbox and block set library	04	2	2	4	08
IV	Analog and Digital Communication	06	2	2	8	12
V	Digital Electronics Circuits using Toolbox and Block sets	06	2	2	8	12
Total		**28**	**10**	**11**	**29**	**50**

Legends: *R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)*
Note*: This specification table provides general guidelines to assist students for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions to assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may slightly vary from above table.*

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course. Students should perform following activities in group (or individual) and prepare reports of about 5 pages for each activity. They should also collect/record physical evidence for their (student's) portfolio which may be useful for their placement interviews:

a) Present seminar on various topics from course content
b) Prepare nameplate of three-phase transformer, three phase induction motor and alternator.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/subtopics.
b) Guide student(s) in undertaking micro-projects.
c) ***'L' in section No. 4 means*** different types of teaching methods that are to be employed by teachers to develop the outcomes.
d) Show animation/ video related to course content.
e) Co-relating the importance of content of this course with other courses/ practical applications. (e.g. importance of a content course or whole course related to A.C. Machines, Transmission and Distribution of Electrical Power, Energy Conservation Switchgear and Protection etc. and in practical industrial &/ domestic applications.
f) Introduce E-waste recycling technology among the students.
g) Guide students on how to address issues on environment and sustainability

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-projects are group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain a dated work diary consisting of individual contributions in the project work and give a seminar presentation of it before submission. The duration of the micro project should be about **12-14 *(fourteen to sixteen) student engagement hours*** during the course. The students ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

a) Make a code to add 03 in every matrix element of an image.
b) Make a code to add 03 in every matrix element of an audio signal.
c) Make a code to add 03 in every matrix element of a video signal.
d) Prepare a chart of differentmatrix functions used in SCILAB.
e) Prepare a chart showing differences between SCILAB and other mathematical software.

13. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Getting started with Matlab	Pratap Rudra	Oxford University Press,New
2	https://www.scilab.org/download/scilab-2023.0.0	https://www.scilab.org/download/scilab-2023.0.0	https://www.scilab.org/download/scilab-2023.0.0
3	Matlab in Engineering	Tyagi	Oxford University Press, New Delhi(latest edition)

14. SOFTWARE/LEARNING WEBSITES

- https://www.scilab.org/software
- https://cloud.scilab.in/
- www.mathworks.com
- ANDROID APP PLAY STORE

15. PO-COMPETENCY-CO MAPPING:

Semester V	Software Practices (Course Code: 4351105)						
	POs						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design / development of solutio	PO4 Engineering Tools, Experimen-tation& Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Manage-ment	PO 7 Life-long learning

			n				
Competency	**Develop and test models of electronic (Analog and Digital) circuits using scientific and technology support software and simulation tools.**						
Course Outcomes CO1 Simulate and test mathematical and functional aspects of electronics and communication engineering principles using the basic features of software tools.	3	2	2	3	1	-	3
CO2 Develop script files for analog electronic circuits.	3	2	1	2	-	-	3
CO3 Develop different models using block-set and toolbox or functions.	3	1	1	1	-	2	3
CO4 Simulate and test analog and digital communication circuits using available functions and toolboxes.	3	3	3	3	1	1	3
CO5 Simulate and test Digital electronic circuits using available functions and toolboxes.	3	3	3	3	1	1	3

*Legend: '**3'** for high, '**2**' for medium, **'1'** for low and **'-'** for no correlation of each CO with PO.*

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

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