K.S.RANGASAMY COLLEGE OF ARTS AND SCIENCE, (AUTONOMOUS)

TIRUCHENGODE - 637215

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

Details of New Courses Introduced

- Core Practical IV: Communication Lab
- SBC Practical I: Circuit Simulation Lab
- Add-On Course I: PCB Design
- Core Practical VI: ICs and Applications Lab
- Allied IV : Programming in JAVA
- Allied Practical-II : Programming in JAVA
- NMEC-II: Electronic Gadgets and Maintenance
- Core IX: Arduino and Internet of Things
- Core Practical – VIII: Internet of Things Lab
- Core Practical –IX: VHDL Programming & Simulation Lab
- SBC –IV: PLC and SCADA

Enclosures:

a. Scheme of Examination - Copy

b. Syllabus copy of the courses along with the course outcomes and mapping.

K.S. RANGASAMY COLLEGE OF ARTS & SCIENCE (AUTONOMOUS) CONTROLLER OF EXAMINATIONS TIRUCHENGODE-637 215

HoD

Dr. K.M. PRABUSANKARLAL, M.Sc.,M.Phil.,M.E.,Ph.D.,
Associate Professor & Head,
Dept. of Electronics & Communication
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Namakkal Dt. T.N.

CoE

Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamil Nadu.

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K.S. Rangasamy College of Arts & Science
(Autonomous)
TIRUCHENGODE - 637 215
Namakkal-Dt. Tamil Nadu. INDIA.

SCHEME OF EXAMINATION

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
First Semester							
Part - I							
18UTALA101/ 18UHILA101/ 18UFRLA101	Tamil-I / Hindi-I/ French-I/	5	3	25	75	100	3
Part - II							
18UENLA101	Foundation English-I	5	3	25	75	100	3
Part - III							
18UECM101	Core I: Physics of Semiconductor Devices	4	3	25	75	100	4
18UECM102	Core II: Digital Electronics	4	3	25	75	100	4
18UMAECA101	Allied I: Algebra and Calculus	5	3	25	75	100	4
18UECMP101	Core Practical –I: Semiconductor Devices Lab	3	3	40	60	100	2
18UECMP102	Core Practical –II: Digital Electronics Lab	2	3	40	60	100	2
Part - IV							
18UVE101	Value Education I: Yoga	2	3	25	75	100	2
	TOTAL	**30**				**800**	**24**
Second Semester							
Part - I							
18UTALA201/ 18UHILA201/ 18UFRLA201	Tamil-II/ Hindi-II/ French-II	5	3	25	75	100	3
Part - II							
18UENLA201	Foundation English-II	5	3	25	75	100	3
Part - III							
18UECM201	Core III: Electronic Circuits	4	3	25	75	100	4
18UECM202	Core IV: Principles of Communication Systems	4	3	25	75	100	4
18UMAECA201	Allied II : Numerical Methods	5	3	25	75	100	4
18UECMP201	Core Practical-III: Electronic Circuits Lab	3	3	40	60	100	2

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(Autonomous)
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Dr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu. India.

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
18UECMP202	Core Practical IV: Communication Lab	2	3	40	60	100	2
	Part – IV						
18UVE201	Value Education II: Environmental Studies	2	3	25	75	100	2
	TOTAL	**30**				**800**	**24**
Third Semester							
	Part – I						
18UTALA301/ 18UHILA301/ 18UFRLA301	Tamil-III / Hindi-III/ French-III	5	3	25	75	100	3
	Part – II						
18UENLA301	Foundation English-III	5	3	25	75	100	3
	Part – III						
18UECM301	Core V: Microprocessor and Interfacing	4	3	25	75	100	4
18UCSECA301	Allied III: Programming in C	4	3	25	75	100	2
18UECMP301	Core Practical –IV: Microprocessor and Interfacing Lab	3	3	40	60	100	2
18UCSECAP301	Allied Practical -I: Programming in C	2	3	40	60	100	2
	Part – IV						
18UECSBP301	SBC Practical I: Circuit Simulation Lab	2	3	40	60	100	2
	NMEC –I	2	3	25	75	100	2
18ULS301	Career Competency Skills I	1	-	-	-	-	-
	Add on Course - I	2	3	-	100	100	-
	TOTAL	**30**				**800**	**20**
Fourth Semester							
	Part – I						
18UTALA401/ 18UHILA401/	Tamil-IV / Hindi-IV/	5	3	25	75	100	

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
18UFRLA401	French-IV						
Part – II							
18UENLA401	Foundation English-IV	5	3	25	75	100	3
Part – III							
18UECM401	Core VI: ICs and Applications	4	3	25	75	100	4
18UCSECA401	Allied IV : Programming in JAVA	4	3	25	75	100	3
18UECMP401	Core Practical –VI: ICs and Applications Lab	3	3	40	60	100	2
18UCSECAP401	Allied Practical -II: Programming in JAVA	2	3	40	60	100	2
Part – IV							
18UECSB401	SBC II: Consumer Electronics (100% Internal Evaluation)	2	3	100	-	100	2
	NMEC –II	2	3	25	75	100	2
18ULS401	Career Competency Skills II	1	-	-	-	-	-
	Add on Course - II	2	3	-	-	-	-
	Advanced Learners Course	-	3	-	-	-	2*
	TOTAL	**30**				**800**	**20**
FIFTH SEMESTER							
PART-III							
18UECM501	Core VII: Computer Networks	5	3	25	75	100	5
18UECM502	Core VIII: Embedded Systems	5	3	25	75	100	5
18UECM503	Core IX: Arduino and Internet of Things	5	3	25	75	100	4
	Elective	5	3	25	75	100	4
18UECMP501	Core Practical VII: Embedded Systems Lab	3	3	40	60	100	2
18UECMP502	Core Practical – VIII: Internet of Things Lab	3	3	40	60	100	2
PART-IV							

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TIRUCHENGODE - 637 215
Namakkal-Dt. Tamil Nadu, India

Dr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
18UECSB501	SBC III: Electronic Media	3	3	25	75	100	2
18ULS501	Career Competency Skills III	1	-	-	-	-	-
	Advanced Learners Course	-	3	-	-	-	2*
PART-V							
18UE501	Extension Activity	-	-	-	-	-	2
	TOTAL	**30**				**700**	**26**
SIXTH SEMESTER							
PART-III							
18UECM601	Core X: Mobile and Cellular Communication	5	3	25	75	100	5
18UECM602	Core XI: VLSI Design and VHDL	5	3	25	75	100	5
18UECM603	Core XII: Biomedical Instrumentation	5	3	25	75	100	4
	Elective	5	3	25	75	100	4
18UECMP601	Core Practical -IX: VHDL Programming & Simulation Lab	3	3	40	60	100	2
18UECMP602	Project Viva voce	3	-	40	60	100	4
PART-IV							
18UECSB601	SBC -IV: PLC and SCADA	3	3	25	75	100	3
18ULS601	Career Competency Skills IV	1	-	-	-	-	-
	TOTAL	**30**				**700**	**26**
						Grand Total	**4600**	**140**

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Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Namakkal Dt.

PRINCIPAL
K.S. Rangasamy College of Arts & Science
(Autonomous)
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Namakkal-Dt. Tamil Nadu. INDIA

Add-On Course

Subject	Subject Code	Subject Name
Add-On Course	18UECAC301	Add-On Course I: PCB Design
	18UECAC401	Add-On Course II: Computer Hardware Installation and Servicing

Advanced Learners Course

Subject	Subject Code	Subject Name
Advanced Learners Course	18UECAL401	Advanced Learners Course I: Digital Signal and Image Processing
	18UECAL402	Advanced Learners Course II: Artificial Intelligence

Allied Subject for computer science department students in THIRD and FOURTH semester

Subject	Subject Code	Subject Name
Allied	18UECCSA301	Allied-III: Digital Electronics and Microprocessor
	18UECCSA401	Allied-IV: Internet of Things

IDC Subject for M.Sc., PHYSICS students in THIRD Semester

Subject	Subject Code	Subject Name
IDC	18PECPHI301	IDC II: Modern Biomedical Instrumentation

NMEC subjects for other department students in THIRD and FOURTH semester

Subject	Subject Code	Subject Name
NMEC	18UECNM301	NMEC-I: Computer Systems and Maintenance
	18UECNM401	NMEC-II: Electronic Gadgets and Maintenance

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Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu.

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FOR COURSE COMPLETION

Students shall complete:

- Language subjects (Tamil/ Hindi/French and English) in I, II, III and IV Semesters.
- Value Education Yoga and Environmental Studies in I and II Semesters respectively.
- Allied subjects in I, II, III and IV semesters.
- Two Add on Courses during Semester III and Semester IV.
- Non Major Elective Courses (NMEC I & NMEC II) during Semester III and Semester IV.
- Skill Based Courses (SBC) from Semester III to Semester VI.
- Extension Activity in V semester.
- Career Competency skills (CCS) from Semester III to Semester VI.
- An individual Project & Viva-Voce at the end of VI semester, but they have to carry out their Project work from V Semester onwards.

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Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu. India.

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TOTAL CREDIT DISTRIBUTION

PART	Credits	Marks
PART- I		
Tamil/Hindi /French (4 X 3 Credits)	12	400 (4X100 Marks)
PART-II		
English (4 X 3 Credits)	12	400 (4X100 Marks)
PART-III		
Core Subjects (16 Papers) (4 X 5 Credits) (10 X 4 Credits) Core Practical (9 Practicals) (9 X 2 Credits) Core Project (1 X 4 Credits)	82	 400 (4X100 Marks) 1000 (10X100 Marks) 900 (9X100 Marks) 100 (1X100 Marks)
Allied (4 Papers +2 Practicals) (2 X 4 Credits) (2 X 2 Credits) (2 X 2 Credits)	16	 200 (2X100 Marks) 200 (2X100 Marks) 200 (2X100 Marks)
PART-IV		
Value Education (2 X 2 Credits) NMEC (2 X 2 Credits) SBC (4 X 2 Credits)	16	200 (2X100 Marks) 200 (2X100 Marks) 400 (4X100 Marks)
PART-V		
Extension Activity (1 X 2 Credits)	2	-
Total	**140**	**4600**

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Controller of Examinations
K.S. Rangasamy College of Arts & Science
Tiruchengode - 637 215. Tamilnadu, India

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18UECMP202	CORE PRACTICAL IV: COMMUNICATION LAB	SEMESTER - II

Course Objectives:

The Course aims

- To develop skills in designing simple communication circuits
- To simulate various communication circuits using software.

Credits:2 **Total Hours: 20**

S.No.	EXPERIMENTS	Hrs	CO
1.	Study of AFO and CRO.	3	CO1
2.	AM Modulator.	3	CO1
3.	AM Demodulator.	3	CO1
4.	FM Modulator.	3	CO2
5.	Study of AM Radio Receiver	3	CO2
6	Study of FM Radio Receiver	3	CO3
7	AM Transmitter (Simulation)	3	CO3
8	FM Transmitter (Simulation)	3	CO4
9	AM Receiver (Simulation)	3	CO5
10.	FM Receiver (Simulation)	3	CO5

Reference Books

1. *Poorna Chandar,S and Sasikala,B. 2006.* **Electronics Laboratory Primer A Design Approach.** S.Chand, New Delhi.

K.S.RANGASAMY COLLEGE OF ARTS & SCIENCE (AUT.) CONTROLLER OF EXAMINATIONS TIRUCHENGODE-637 215

Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215.

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COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	perform basic operations such as generate various waveforms and measurements using CRO.
CO2	understand the AM Modulator circuit and measure modulation index.
CO3	identify the various stages and track signals in AM Radio Receiver.
CO4	design AM & FM Transmitter through Simulation.
CO5	implement a superheterodyne AM & FM Receiver using Simulation.

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Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu.

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18UECSBP301	SBC PRACTICAL I: CIRCUIT SIMULATION LAB SEMESTER -III

Course Objectives:

The Course aims

- To learn the practical skills to design printed circuit boards.
- To perform simulation of various Analog/Digital circuits using software.

Credits:2 **Total Hours: 20**

S.No	Experiments	Hrs	CO
1.	PCB Layout design	3	CO1
2.	PCB Layout printing and Etching.	3	CO1
3.	LED on/off using Transistor.	3	CO2
4.	Blinking LED using 555 timer	3	CO2
5.	5V power supply	3	CO3
6	AC-DC converter.	3	CO3
7	DC motor speed control using SCR	3	CO4
8	Touch switch	3	CO4
9	Fan regulator using DIAC	3	CO4
10.	Automatic solar powered street light	3	CO5

Reference Books

1. *Walter C Bosshart*, 1996, **Printed Circuit Boards Design and Technology [First Edition]**. Tata Mcgraw-Hill, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	perform different aspects of PCB design.
CO2	create simple circuits using ICs.
CO3	design power circuits for various applications.
CO4	analyze different waveform in designing of AC-DC converter.
CO5	develop power control circuits.

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K.S.RANGASAMY COLLEGE OF ARTS & SCIENCE (AUTONOMOUS) CONTROLLER OF EXAMINATIONS TIRUCHENGODE-637 215. INDIA

Mr. M. PRASAD, M.Sc., M.B.A., M.Phil., Controller of Examinations K.S. Rangasamy College of Arts & Science (Autonomous) Tiruchengode - 637 215. Tamilnadu. India.

18UECAC301	ADD-ON COURSE I: PCB DESIGN	SEMESTER – III

Course Objectives:

The Course aims

- To analyze and interpret test results and measurements on electric circuits.
- To learn about effective use of design rules & interfacing between schematic & PCBs.
- Understand the basic component placement & routing techniques for various technologies.

Total Hours: 25

UNIT	CONTENTS	Hrs	CO
I	**Basics of PCBs:** Evaluation of PCBs-Classification of PCBs-Development of PC- Single-sided PCBs-Manufacturing of basic PCBs-Single-sided boards-Challenges in modern PCB design and Manufacture- Standard on PCBs.	05	CO1
II	**Layout Planning and design:** Reading drawings and diagrams-Block diagram-General PCB design considerations-Important design elements-Mechanical design considerations-Board mounting techniques-Board guiding and retaining-Input/output terminations-Board extraction-Testing and servicing-Mechanical stress-Board thickness-Layout design-Grid systems-Layout scale.	05	CO2
III	**Artwork Generation:** Basic approach to manual artwork-Ink drawing on white card board sheets-General design guidelines for artwork preparation-Conductor orientation-Conductor routing- Conductor spacing-Hole diameter and solder pad diameter-The square land/pad.	05	CO3
IV	**Etching Techniques:** Etching solutions and chemistry-Ferric chloride-Hydrogen peroxide-sulphuric acid-Etching arrangements-Simple batch production etching-Equipment and	05	CO4

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Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Au...)
Tiruchengode - 637 215. Tamil Nadu, India.

	techniques-Immersion Etching-Bubble Etching-Splash Etching-Spray Etching.		
V	**Multi-layer boards:** Interconnection techniques-Conventional plated through-hole-Buried Via-Blind Vias-Materials for Multi-layer boards-Resin system-Reinforcement materials-Prepreg-copper foil-Fabrication process for multi-layer boards-General process-Lamination-Post-lamination process- Multi-layer drilling-Schematic key for multi-layer built-ups.	05	CO5

Text Book

1.	*R.S.Khandpur*. 2005. **Printed Circuit Boards, Design, Fabrication, Assembly and testing.** TMH, New Delhi.

Reference Book

1.	Christopher T. Robertson, 2004. **Printed Circuit Board Designers Reference basics,** Pearson Education, New Jersey.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	analyze the fundamentals on all the basics of PCB designing.
CO2	perform the chemical and mechanical processes by using positive/negative masks.
CO3	gain the knowledge of art work preparation.
CO4	understand the etching process for final PCBs.
CO5	design the interconnection technique for multilayer boards.

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Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations
K.S.Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu.

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18UCSECA401	ALLIED IV: PROGRAMMING IN JAVA (For the students of Electronics and Communication)	SEMESTER - IV

Course Objectives:

The course aims

- To understand the fundamentals of Object Oriented Programming.
- To explore the programming skills using Java.

Credits: 4 **Total Hours:50**

UNIT	CONTENTS	Hrs	CO
I	**Java Evolution**: Java History – Java Features - How Java differs from C and C++ - Java and Internet – Java and World Wide Web - Web Browsers. **Overview of Java Language:** Simple Java program - Java program Structure - Java Tokens - Java Statements – Java Virtual Machine. **Constants, Variables and Data Types**: Constants - Variables - Data Types - Declaration of Variables –Giving values to variables - Scope of variables - Symbolic Constants - Type casting - Getting value of variables - Standard and default values.	10	CO1
II	**Operators and Expressions**: Introduction - Arithmetic Operators - Relational Operators - Logical Operators - Assignment Operators - Increment and Decrement Operators - Conditional Operator - Bitwise Operators - Special Operators - Arithmetic Expressions - Evaluation of Expressions - Precedence of Arithmetic operators - Type conversions in Expressions - Operator Precedence and Associativity - Mathematical functions. **Decision Making and Branching:** Decision making with if Statement - Simple if Statement - The If..Else statement - Nesting of If..Else Statements - The Else If Ladder - The Switch Statement – The?: Operator. **Decision Making and Looping:** The while Statement - The do Statement - The for Statement - Jumps in Loops - Labeled Loops.	10	CO2

III	**Classes, Objects and Methods:** Introduction - Defining a Class - Fields Declaration - Methods Declaration - Creating Objects - Accessing Class Members – Constructors - Methods Overloading - Static Members - Nesting of Methods - Inheritance: Extending a Class - Overriding Methods - Final Variables and Methods - Final Classes - Finalizer Methods - Abstract Methods and Classes - Methods with Varargs - Visibility Control. **Arrays, Strings and Vectors:** Introduction – One - dimensional Arrays - Creating an Array - Two - dimensional Arrays–Strings – Vectors - Wrapper Classes - Enumerated Types. **Interfaces: Multiple Inheritances:** Introduction - Defining Interfaces - Extending Interfaces - Implementing Interfaces - Accessing Interface Variables. **Packages: Putting classes Together:** Introduction - Java API Packages - Using System Packages - Naming Conventions - Creating Packages - Accessing a Package - Using a Package - Adding a Class to a Package - Hiding Classes - Static Import.	10	CO3
IV	**Multithreaded Programming:** Introduction - Creating Threads - Extending the Thread Class - Stopping and Blocking a Thread - Life Cycle of Thread - Using Thread Methods - Thread Exception - Thread Priority - Synchronization - Implementing the 'Runnable' Interface. **Managing Errors and Exceptions:** Introduction - Types of Errors - Exceptions - Syntax of Exception Handling Code - Multiple Catch Statements - Using Finally Statement - Throwing Our Own Exceptions - Using Exception for Debugging.	10	CO4
	Applet Programming: Introduction –How Applets Differ from Applications - Preparing to Write Applets - Building Applet Code - Applet Life Cycle - Creating an Executable Applet -		

V	Designing a Web Page - Applet Tag - Adding Applet to HTML File - Running the Applet - More About Applet Tag - Passing Parameters to Applets - Aligning the Display - More about HTML Tags - Displaying Numerical Values - Getting Input from the User. **Managing Input/Output Files in Java**: Introduction - Concepts of Streams - Stream Classes – Byte Stream classes - Character stream classes - Using streams – Other Useful I/O Classes – Using the File Class – Input/Output Exceptions – Creation of Files – Reading / Writing Characters - Reading / Writing Bytes - Handling Primitive Data Types – Random Access Files.	10	CO5

Text Book

1. *Balagurusamy, E.* 2008. **Programming with Java – A Primer.** [*Third Edition*].Tata McGraw Hill Education Pvt. Limited, New Delhi.

Reference Books

1. *C. Xavier.* 2008. **Programming with Java 2.** [*Seventh Reprint*]. Scitech Publications India Pvt. Limited.
2. *Yashavant P.Kanenetkar.*2012. **Let Us Java.** [*First Edition*], BPB Publications, New Delhi.
3. *Mahesh P.Matha.* 2011. **Core Java a Comprehensive Study.** Prentice Hall of India, New Delhi.

WEB REFERENCES:

1. http://www.tutorialpoint.com
2. http://www.w3school.com
3. http://java.sun.com

K.S. RANGASAMY COLLEGE OF ARTS & SCIENCE (AUTONOMOUS) CONTROLLER OF EXAMINATIONS TIRUCHENGODE

Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science
Tiruchengode - 637 215

PRINCIPAL
K. S. Rangasamy College of Arts & Science
(Autonomous)
TIRUCHENGODE - 637 215
Namakkal-Dt. Tamil Nadu. INDIA

COURSE OUTCOMES (CO):

After the completion of the course, the student will be able to:

CO1	Understand the basic terminology of Java Programming
CO2	Develop programs using control structures
CO3	Able to understand the interfaces and packages
CO4	Understand the multithreaded programming and exceptions
CO5	Develop program using Applets and files

MAPPING:

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	L	M	L
CO2	M	H	M	H	H
CO3	M	M	M	M	H
CO4	M	M	M	M	H
CO5	M	H	M	H	H

H-High; M-Medium; L-Low

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Mr. M. PRASAD, M.Sc., M.B.A., M.P...
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu.

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18UECMP401	CORE PRACTICAL – VI: ICs AND APPLICATIONS LAB	SEMESTER IV

Course Objectives:

The Course aims

- To design circuits using operational amplifier for various applications.
- To develop timer based circuits for various applications.

Credits: 2 **Total Hours: 30**

S.No	Experiments	Hrs	CO
1.	Inverting and Non Inverting amplifier using Op-Amp	3	CO1
2.	Adder and Subtractor using Op-Amp	3	CO1
3.	Differentiator using Op-Amp	3	CO1
4.	Integrator using Op-Amp	3	CO1
5.	Astable Multivibrators using Op-Amp	3	CO1
6	Monostable Multivibrators using Op-Amp	3	CO1
7	Astable Multivibrators using 555 timer	3	CO2
8	Monostable Multivibrators using 555 timer	3	CO2
9	Schmitt Trigger using 555 Timer.	3	CO2
10.	Waveform Generator using 555 Timer.	3	CO3

Reference Books

1. *Roy chouchury Sahil Jain.D. 2003.* **Linear Integrated circuits** [Second Edition]–New age international, New Delhi.
2. *Poorna Chandar,S and Sasikala,B. 2006.* **Electronics Laboratory Primer A Design Approach.** S.Chand, New Delhi.

K.S.RANGASAMY COLLEGE OF ARTS & SCIENCE (AUTONOMOUS) CONTROLLER OF EXAMINATIONS TIRUCHENGODE-637 215

Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
Controller of Examinations
K.S. Rangasamy College of Arts & Science
Tiruchengode - 637 215. Tamil Nadu.

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K.S. Rangasamy College of Arts & Science
(Autonomous)
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Namakkal-Dt. Tamil Nadu. INDIA

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	design operational amplifier based circuits.
CO2	design timer based circuits.
CO3	develop waveform generation circuits.

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Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations
KS Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu.

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K.S. Rangasamy College of Arts & Science
(Autonomous)
TIRUCHENGODE - 637 215
Namakkal Dt. Tamil Nadu. INDIA

18UECNM401	NMEC II: ELECTRONIC GADGETS AND MAINTENANCE	SEMESTER – IV

Course Objectives:

The Course aims

- To understand the principle of audio devices.
- Troubleshoot the home and office appliances.
- To acquaint with various devices related to automobile electronics.

Credits:2 **Total Hours: 25**

UNIT	CONTENTS	Hrs	CO
I	**Audio I/O Equipments:** Microphones- Characteristics-Types-Headphones and Headsets-Types of Headphones-Hearing Aids- Ideal Loudspeakers- Basic Loudspeakers-Woofers-Tweeters.	05	CO1
II	**Home Appliances:** Microwave Woven- Block Diagram-Types- Washing Machines-Types-Air Conditioners- Split Air Conditioner-Refrigerators.	05	CO2
III	**Office Appliances:** Facsimile Machine-Block Diagram-Xerographic Process-Calculators- Digital Clock.	05	CO3
IV	**Remote Control:** Ultrasonic Transducers-Remote Control Transmitter-Ultrasonic Transmitter- Troubleshooting remote control system- Remote Control Operation.	05	CO4
V	**In- Car Computers:** Antilock Braking System (ABS) - Instrument panel displays-Ultrasonic Car safety belt system-Air bag system-Satellite based Car Navigation Systems.	05	CO5

Text Book:

1. *Bali,S.P.* 2007. **Consumer Electronics.** [First Edition]. Pearson Education, New Delhi.

Reference Books:

1. *Chitode. J .S.* 2007. **Consumer Electronics.** [First Edition]. Technical

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K.S. Rangasamy College of Arts & Science (Autonomous)
TIRUCHENGODE - 637 215
Namakkal Dt. Tamil Nadu

CONTROLLER OF EXAMINATIONS

Mr. M. PRASAD, M.Sc., M.B.A.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu, India.

	Publication, Pune.
2.	*Philip Hoff and Philip Herbert Hoff.* 2010. **Consumer Electronics for Engineers.** [First Edition]. Cambridge University Press, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the basics and working of different audio devices.
CO2	identify the need of preventive maintenance for home appliances.
CO3	trouble shoots the problems in the office appliances.
CO4	understand the basics of remote control system.
CO5	study the electronic gadgets through the automobile applications.

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Mr. M. PRASAD, M.Sc., M.B.A.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu, India.

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(Autonomous)
TIRUCHENGODE - 637 215
Namakkal Dt. Tamil Nadu. INDIA

18UECMP502	CORE PRACTICAL VIII:INTERNET OF THINGS LAB	SEMESTER – V

Course Objectives:

The Course aims

- To provide knowledge about arduino boards and basic components.
- To develop skills to design and implement various smart system applications.

Credits: 2 **Total Hours: 30**

S.No	Experiments	Hrs	CO
1.	Blinking and Sequential LED	3	CO1
2.	Key interfacing	3	CO1
3.	Interfacing LCD	3	CO1
4.	Interfacing Ultrasonic Sensor	3	CO1
5.	Bluetooth based home automation	3	CO2
6.	IR sensor interfacing	3	CO2
7.	DC motor Speed Control using PWM	3	CO2
8.	Arduino Based Serial Communication	3	CO3
9.	Build an ESP8266 Web Server and Weather Forecaster	3	CO3
10.	IoT Based Street Light Monitoring System	3	CO3

Reference Books

1.	*Michael McRoberts,* Apress,2013.**Beginning Arduino** [Second Edition]
2.	*John-David Warren, Josh Adams, Harald Molle,* Apress,2011 **Arduino Robotics**

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to

CO1	understand the basic programming with arduino
CO2	design different sensors for automation
CO3	develop interfacing to real world devices

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K.S. RANGASAMY COLLEGE OF ARTS & SCIENCE (AUTONOMOUS) CONTROLLER OF EXAMINATIONS TIRUCHENGODE-637 215. INDIA

Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamil Nadu.

18UECM503	CORE IX: ARDUINO AND INTERNET OF THINGS	SEMESTER – V

Course Objectives:

- To understand how multiple smart electronic devices can connect themselves together through internetworking.
- To acquire the fundamentals of designing, programming and configuring devices for the smart infrastructure development and maintenance.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Arduino:** Introduction to Arduino-Functional block diagram of Arduino-Arduino family of boards-Arduino UNO- Features-Communication-Platform-Terminology-Introduction to Arduino Programming-Keywords -Inbuilt Functions -Variables and data types-Libraries- Arduino Boot Loader.	10	CO1
II	**Atmega328:** Pin function of Arduino UNO-Digital GPIO Programming-Working with pins as input and output-Working with PWM outputs-Working with analog inputs using on-chip ADC Serial communication between Arduino hardware and PC-Interrupt- Blinking of LED-Interfacing LCD.	10	CO2
III	**Internet of Things: IoT** Definition –vision-Smart and hyper connected devices-IoT Conceptual framework- IoT Architectural view-technology behind IoT- Big Data Analytics.	10	CO3
IV	**Design Principles for Connected Devices-** IoT/M2M systems layers and designs standardization; communication technologies -Design principles for Web Connectivity-Web Communication Protocols for Connected Devices-Internet connectivity Principles-Internet Connectivity-Internet Based Communication.	10	CO4
V	**Applications of IoT:** IoT application for smart homes-Smart City-Smart city parking-Connected car and services-Smart Environment monitoring-Weather monitoring System-Air pollution Monitoring System–Forest Fire Detection-Agriculture-Smart irrigation-Smart wine quality enhancing-	10	CO5

	Smart city street lights Control.		
Text Books			
1.	*Michael McRoberts,* 2013 **Beginning Arduino,** Second Edition, Apress, (Unit I & II)		
2.	*Raj Kamal,*2017 **Internet of Things Architecture and Design Principles,** McGraw Hill Education Pvt.Ltd.,[First edition] (Unit III ,IV &V)		
Reference Books			
1.	*John-David Warren, Josh Adams, Harald Molle,* 2011 **Arduino Robotics ,Apress.**		
2.	*Rajkumar Buyya, Amir Vahid Dastjerdi.* 2016. **Internet of Things: Principles and Paradigms.** Morgon Kaufmann- Elsevier Publications.		

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the structure of arduino boards and programming concepts.
CO2	describe the function of arduino UNO and interfacing concepts
CO3	understand the basic principles, requirements, functions and system architecture of IoT.
CO4	prototype embedded devices for IoT and M2M , embedded platforms and design software for IoT applications.
CO5	analyze the functioning of IoT applications in smart premises, connected car, environment monitoring and agriculture through quantitative case studies.

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	H	M	M
CO2	L	L	M	M	H
CO3	M	M	H	H	M
CO4	L	M	M	H	H
CO5	H	M	M	H	M

H-High; M-Medium; L-Low

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TIRUCHENGODE - 637 215
Namakkal-Dt. Tamil Nadu. INDIA

K.S. RANGASAMY COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)
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Mr. M. PRASAD, M.Sc., M.B.A.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu, India

18UECMP601	CORE PRACTICAL IX: VHDL PROGRAMMING AND SIMULATION LAB	SEMESTER – VI

Course Objectives:

The Course aims

- To introduce a hardware description language for the specification and simulation of digital logic systems.
- To implement combinational and sequential circuits using VHDL.
- To practice the design and simulation of different circuits.

Credits: 2 **Total Hours: 30**

S.No	Experiments	Hrs	CO
VHDL PROGRAMMING			
1.	Verification of Logic Gates	3	CO1
2.	Half Adder and Full Adder	3	CO2
3.	Half Subractor and Full Subractor	3	CO2
4.	Multiplexer and Demultiplexer	3	CO2
5.	Encoder and decoder	3	CO2
6.	Flip Flops (RS & D)	3	CO2
7.	Solving Boolean Equation.	3	CO2
MATLAB SIMULATION			
8.	Solving Arithmetic Equation	3	CO3
9.	Solving Matrix (Rows and Columns, Inverse Matrix, Transpose Matrix)	3	CO3
10.	Plotting the Curve	3	CO3

Reference Book

1. *Bhasker, J.* 1999. A **VHDL Primer.** [Third Edition]. Prentice Hall of India Publication, New Delhi.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to

CO1	understanding the synthesis and simulation process of codes.
CO2	analyze, design and simulate combinational and sequential logic circuits
CO3	design and develop applications using simulation packages.

Mr. M. PRASAD, M.Sc., M.Phil.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu.

18UECSB601	SBC IV: PLC & SCADA	SEMESTER -VI

Course Objectives:

The Course aims

- To understand the concept of Programmable logic controller and identify its application areas.
- To understand the need for PLC Programming and PLC Instructions.
- To apply the SCADA for the design of real time industrial Applications.

Credits: 2 **Total Hours:25**

UNIT	CONTENTS	Hrs	CO
I	**Programmable Logic Controllers (PLCs):** Parts of PLC - Principles of operation - Modifying the operation - PLC size and application - PLC Hardware Components: The I/O section - Discrete section - Analog section - Special I/O modules.	05	CO1
II	**Basics of PLC Programming:** Processor memory organization – Program files - Data files – Program scan - PLC Programming Languages - Relay type instructions - Instruction addressing - Programming Examine IF closed and Examine IF open instructions - Electromagnetic control relay.	05	CO2
III	**PLC Instructions:** Timer Instructions: ON Delay timer instructions - OFF Delay timer instructions - Retentive Timer - Cascading Timers - Counter Instructions: UP Counter - Down Counter.	05	CO3
IV	**SCADA:** Convergence of Evolving Technologies-Early Automation systems – The Human Interface – Communications and Integration-Basics of SCADA Signal Processing - Defining the Scope of SCADA Software - Use of Generalized Terminology.	05	CO4
V	**SCADA Software:** Typical SCADA System Architecture - Field Devices and Signals- Programmable Process Controller - SCADA Operations-User Workstation- Communication Network - Sample Application: WTP SCADA System (Qualitative study).	05	CO5

Text Books

1. *Frank D. Petruzella.* 2010. **Programmable Logic Controllers.** [Third Edition]. Tata McGraw

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(Autonomous)
TIRUCHENGODE - 637 215
Namakkal-Dt. Tamil Nadu. INDIA

K.S. RANGASAMY COLLEGE OF ARTS & SCIENCE (AUTONOMOUS) CONTROLLER OF EXAMINATIONS TIRUCHENGODE-637 215.

Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu.

	Hill, New Delhi. (UNIT-I) to (UNIT-III).
2.	*Stuart G. McCrady*. 2013. **Designing SCADA Application Software: A Practical Approach.** [First Edition]. Elsevier. (UNIT-IV and V).
Reference Books	
1.	*W. Bolton*. 2011. **Programmable Logic Controllers**. [Fifth Edition]. Elsevier Publications.
2.	Stuart A. Boyer. 2010. **SCADA: Supervisory Control and Data Acquisition.** [Fourth Edition]. International Society of Automation. United States.

COURSE OUTCOMES (CO)

After the completion of the course, the student will be able to:

CO1	understand the theory of Programmable Logic Controller
CO2	understand the basics of PLC programming
CO3	substantiate the PLC Instructions
CO4	understand the theoretical concepts of SCADA
CO5	analyze the SCADA sample applications

MAPPING

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	H	M	M
CO2	L	L	M	M	H
CO3	L	M	H	H	M
CO4	M	M	M	H	H
CO5	M	M	M	H	M

H-High; M-Medium; L-Low

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Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu. India.

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K.S. Rangasamy College of Arts & Science
(Autonomous)
TIRUCHENGODE - 637 215
Namakkal-Dt. Tamil Nadu. INDIA