K.S. RANGASAMY COLLEGE OF ARTS AND SCIENCE

(Autonomous)

Tiruchengode – 637 215

Department of Physics

Courses having focus on Employability/Entrepreneurship/Skill Development

PROGRAMME: BACHELOR OF SCIENCE IN PHYSICS

Course Code	Course Name	Employability/ Entrepreneurship/ Skill Development	Content
18UPHM401	Core VI: Basic Electronics	Employability	**Unit IV:** Light Emitting Diode (LED) and its applications - Photo diode - Characteristic of photodiode – Applications. **Unit V:** Inverting amplifier – Noninverting amplifier – Adder – Subtractor – Integrator – Differentiator.
18UPHM504	Core X: Electronics and Communication	Employability	**Unit IV:** Antenna fundamentals – Wave propagation - Satellites - Orbits - Satellite communication systems, **Unit V:** Satellite TV, Cable TV, TV Channels, DTH Technology
18UPHM202	Core IV: Optics	Entrepreneurship	**Unit II:** Determination of diameter of a thin wire by air wedge – Michelson's Interferometer
18UPHM501	Core VII: Electricity and Electromagnetism	Entrepreneurship	**Unit IV:** Power in an AC circuit – Wattless current - Choke coil - Construction and working of transformers (step up & down) - Energy losses and uses – Skin effect – Tesla coil.
18UPHSB301	SBC I: Instrumentation	Skill Development	**Unit I:** Basic Characteristics of measuring devices – Calibration. **Unit III:** Analog display and recorder – Graphic recorder – Optical oscillograph

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18UPHSB401	SBC II: Laser Physics	Skill Development	**Unit II:** Helium – Neon Laser – Ruby Laser. **Unit V:** Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment. **Unit III:** Photo detection (photo electric effect, photo sensitive elements), Photo multiplier tube, detectors at different wavelength and their properties
18UPHSB501	SBC III: Spectrophysics	Skill Development	**Unit II:** Applications: Determination of Bond length - **Unit V:** Determination of atomic mass, NMR & ESR Spectroscopy
18UPHSB601	SBC IV: Materials and Processing	Skill Development	**Surface Treatment of Materials:** Introduction – Carburizing – Nitriding -Cyaniding – Carbonitriding – Hardening – Coating – Faced coatings – Weldings – Various welding processes – Process of soldering – Soldering alloys – Laser and Plasma surface treatment.

HoD

Dr. M. VENKATESH, M.Sc., Ph.D.
Assistant Professor & Head
Department of Physics
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu. India

K.S. Rangasamy College of Arts and Science (Autonomous) * Tiruchengode - 637 215 * Tamilnadu

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(Autonomous)
TIRUCHENGODE - 637 215
Tal Dt, Tamil Nadu

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

K.S. Rangasamy College of Arts and Science
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Tiruchengode – 637 215

Department of Physics (UG)

Courses focus on Employability/Entrepreneurship/Skill Development

1. Employability
    a. Basic Electronics
    b. Electronics and Communication

2. Entrepreneurship
    a. Optics
    b. Electricity and Electromagnetism

3. Skill Development
    a. SBC I: Instrumentation
    b. SBC II: Laser Physics
    c. SBC III: Spectrophysics
    d. SBC IV: Materials and Processing

List of Encl.:

- Copy of Scheme of Examination
- Syllabus copy of the courses highlighting the focus on Employability/ Entrepreneurship/Skill Development
- Mapping of the courses focus to Employability/Entrepreneurship/Skill Development

HoD

Dr. M. VENKATESH, M.Sc., Ph.D.
Assistant Professor & Head
Department of Physics
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu. India

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

CoE

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

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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)	Max 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						
18UPHM101	Core I: Properties of Matter and Sound	5	3	25	75	100	5
18UPHM102	Core II: Thermal Physics	5	3	25	75	100	4
18UMAPHA101	Allied I: Algebra and Differential Calculus	5	3	25	75	100	4
18UPHMP101	Core Practical I: Practical Physics I	3	3	40	60	100	2
	Part IV						
18UVE101	Value Education I:Yoga	2	3	25	75	100	2
	Total	30				700	23
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						
18UPHM201	Core III: Mechanics	5	3	25	75	100	5
18UPHM202	Core IV: Optics	5	3	25	75	100	4
18UMAPHA201	Allied II: Integral Calculus and Vector Calculus	5	3	25	75	100	4
18UPHMP201	Core Practical II: Practical Physics II	3	3	40	60	100	2
	Part IV						
18UVE201	Value Education II: Environmental Studies	2	3	25	75	100	2
	Total	30				700	23

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

CONTROLLER OF EXAMINATIONS

Mr. M. PRASAD, M.Sc., M.E.A.,
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)	Max Marks			Credit Points
				CA	CE	Total	
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						
18UPHM301	Core V: Atomic Physics	5	3	25	75	100	5
18UCSPHA301	Allied III: Programming in C	3	3	25	75	100	2
18UPHMP301	Core Practical III: Practical Physics III	3	3	40	60	100	2
18UCSPHAP301	Allied Practical I: Programming in C	2	3	40	60	100	2
	Part IV						
18UPHSB301	SBC I: Instrumentation	2	3	25	75	100	2
	NMEC I	2	3	25	75	100	2
	Non Credit						
18ULS301	Career Competency Skills I	1	-	-	-	-	-
	Add-on Course	2	-	-	-	-	-
	Total	**30**				**800**	**21**
Fourth Semester							
	Part I						
18UTALA401/ 18UHILA401/ 18UFRLA401	Tamil IV/ Hindi IV/ French IV	5	3	25	75	100	3
	Part II						
18UENLA401	Foundation English IV	5	3	25	75	100	3
	Part III						
18UPHM401	Core VI: Basic Electronics	5	3	25	75	100	5
18UCHPHA401	Allied IV: Chemistry	3	3	25	75	100	2
18UPHMP401	Core Practical IV: Practical Physics IV	3	3	40	60	100	2
18UCHPHAP401	Allied Practical II: Chemistry	2	3	40	60	100	2
	Part IV						
18UPHSB401	SBC II: Laser Physics	2	3	25	75	100	2
	NMEC II	2	3	25	75	100	2
	Non Credit						
18ULS401	Career Competency Skills II	1	-	-	-	-	-
	Add-on Course	2	-	-	-	-	-
	Total	**30**				**800**	**21**

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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. India

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Max Marks			Credit Points
				CA	CE	Total	
Fifth Semester							
	Part III						
18UPHM501	Core VII: Electricity and Electromagnetism	6	3	25	75	100	5
18UPHM502	Core VIII: Solid State Physics	5	3	25	75	100	5
18UPHM503	Core IX: Mathematical Physics (Fifth Unit Self-Study)	5	3	25	75	100	4
18UPHM504	Core X: Electronics and Communication	4	3	25	75	100	4
18UPHEL501	Elective I: Energy Physics	4	3	25	75	100	4
18UPHEL502	Elective I: Geophysics						
18UPHMP501	Core Practical V: Practical Physics – V	3	3	40	60	100	2
	Part IV						
18UPHSB501	SBC III: Spectrophysics	2	3	25	75	100	2
	Part V						
18UPHE501	Extension Activity	-	-	-	-	-	2
	Non Credit						
18ULS501	Career Competency Skills III	1	-	-	-	-	-
	Total	30				700	28
Sixth Semester							
	Part III						
18UPHM601	Core XI: Quantum Mechanics and Relativity	6	3	25	75	100	5
18UPHM602	Core XII: Nuclear Physics	6	3	25	75	100	5
18UPHM603	Core XIII: Digital Electronics and Microprocessor	5	3	25	75	100	4
18UPHEL601	Elective II: Physics of Nanoscale	4	3	25	75	100	4
18UPHEL602	Elective II: Biomedical Instrumentation						
18UPHMP601	Core Practical VI: Practical Physics -VI	3	3	40	60	100	2
18UPHPR601	Project & Viva - Voce	3	3	40	60	100	2
	Part IV						
18UPHSB601	SBC IV: Materials and Processing	2	3	25	75	100	2
	Non Credit						
18ULS601	Career Competency Skills IV	1	-	-	-	-	-
	Total	30				700	24
	Grand Total					4400	140

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Namakkal-Dt. Tamil Nadu. INDIA

K.S. RANGASAMY COLLEGE OF ARTS & SCIENCE (AUTO.) 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. Tamilnadu

18UPHM401	CORE VI: BASIC ELECTRONICS	SEMESTER – IV

Course Objectives:

The course aims

- To provide fundamental knowledge regarding semiconductors, diodes, rectifiers, transistor and amplifiers.
- To provide basic concepts regarding oscillators, Special semiconductor devices and operational amplifiers.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Semiconductors and diodes:** Classification of solids in terms of forbidden energy gap – Intrinsic and extrinsic semiconductor – PN junction diode – Biasing of PN junction – VI Characteristics of diode – Rectifiers – Half wave – full wave and bridge rectifiers – Break down mechanisms – Zener diode characteristics of Zener diode – Zener diode as voltage regulator.	10	CO 1
II	**Transistors:** Transistor Types - different modes of operation - Characteristics in CE - CC and CB modes - Transistor biasing - Base bias - Emitter bias - Voltage divider bias - Emitter follower. **Transistor Amplifier:** Two port representations of a transistor - h-parameters - RC coupled amplifier - Frequency response - Classification of amplifiers - Class A power amplifier – Push pull - Class B power amplifier.	10	CO 2
III	**Feedback and Oscillators:** Theory Feedback in amplifier - Effect of negative feedback - Concept of feedback oscillators – Hartley - Colpitt's - Phase shift and Wein bridge oscillators - Expressions for frequency of oscillation and condition for oscillation in each case	10	CO 3
IV	**Special Semiconductor Devices:** Light Emitting Diode (LED) and its applications - Photo diode - Characteristic of photodiode – Applications - Field Effect Transistor (FET) – Types - JFET – Working principle of JFET - JFET parameters - Comparison between JFET and Transistor – Applications of JFET - MOSFET – Working principle of MOSFET.	10	CO 4
V	**Operational Amplifiers:** Introduction - Characteristics of an ideal Op-Amp - Differential amplifier - Common mode rejection ratio – Virtual ground – Inverting amplifier – Noninverting amplifier – Adder – Substractor – Integrator – Differentiator.	10	CO 5

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(Autonomous)
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Namakkal-Dt. Tamil Nadu, INDIA

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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.

Text Book
1. *Metha, V.K. and Shalu Metha.* 2006. **Principles of Electronics.** [Tenth Edition]. S. Chand, New Delhi.
Reference Books
1. *Millman Halkias and Parikh.* 2011. **Integrated Electronics.** [Second Edition]. Tata McGraw Hill Ltd. 2. *Robert,* L. Boylestad, Louis Nashelsky 2009. **Electronic Devices and Circuit Theory**. Dorling Kinderslay (India) Private Limited. 3. *Sedha, R.S.* 2013. **A Textbook of Digital Electronics.** [Fifth Edition]. S. Chand, New Delhi. 4. *Theraja ,B.L.* 2005. **Basic Electronics.** [Fifth Edition]. S. Chand, New Delhi.
Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO1	Comprehend the operating principles of special semiconductor devices and optoelectronic devices.
CO2	Describe the basic principle and characterization of transistors of for current and voltage amplification process.
CO3	Know the concept of feedback amplification process and various oscillator circuits.
CO4	Demonstrate the switching and amplification application of the semiconductor devices.
CO5	Describe the ideal and practical operational amplifier their electrical parameters, need for op-amp. Explain different application circuits using op- amp.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18UPHM504	CORE X: ELECTRONICS AND COMMUNICATION	SEMESTER – V

Course Objectives:

The course aims

- To provide fundamentals regarding amplitude and frequency modulation.
- To enhance the students skill in communication and application.

Credits: 4 **Total Hours: 45**

UNIT	CONTENTS	Hrs.	CO
I	**Amplitude Modulation** : The elements of communication systems – The electromagnetic spectrum – Amplitude modulation principles - Modulation index - Side bands - Power distribution – Single side band communication –amplitude modulators - Balanced modulators - SSB circuits.	9	CO 1
II	**Frequency Modulation:** Frequency Modulation principle - Phase modulation –Side bands - Modulation index - Frequency Modulator - Phase modulator - Frequency demodulator.	9	CO 2
III	**Receivers:** Super heterodyne receiver – Intermediate Frequency selection and images - AM receiver - FM receiver - Communication receiver.	8	CO 3
IV	**Communication Systems:** Antenna fundamentals - Wave propagation - Satellites - Orbits - Satellite communication systems – Earth station- Microwave Techniques: Waveguide – Klystron - Reflex Klystron – Magnetron - Traveling Wave Tube.	9	CO 4
V	**Modern Communication systems and Applications:** Facsimile – Concept – Charge coupled device – Scanning mechanism – Block Diagram of Facsimile – Cellular Radio system – Cellular transmitter and receiver – RADAR – Principle – Pulsed radar – Satellite TV, Cable TV, TV Channels, DTH Technology – Interlaced – Scanning – Colour signals - Basic concept of TDMA, FDMA, LTE, 5G and FSO (Free Space Optical Communication).	10	CO 5

Text Book

1. *Frenzel and Louis.* E. 2017. **Communication Electronics**. [Third Edition]. McGraw Hill International Edition, Singapore.

Reference Books

1. *George Kennedy and Bernard Davis.* 2002. **Electronics Communication Systems.**

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

CONTROLLER OF EXAMINATIONS

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

[Fourth Edition]. Tata McGraw –Hill Publishing Company Ltd., New Delhi.
2. *William Schweber.* 2002. **Electronic Communication system.** [Fourth Edition]. Prentice Hall Ltd., New Delhi.
3. *Dennis Roddy and John Coolen.* 2008. **Electronic Communication.** [Fourth Edition]. Prentice Hall Ltd., New Delhi.
4. Arunabha Ghosh, Jun Zhang, Jeffrey G. Andrews, Rias Muhamed. 2010. **Fundamentals of LTE.** Prentice Hall Ltd., New Delhi.
5. Erik Dahlman, Stefan Parkvall, Johan Skold, Per Beming. 2010. **3G Evolution: HSPA and LTE for Mobile Broadband Evolution.** Academic Press, Elsevier.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Understand the fundamentals of communication system, modulation and demodulation.
CO 2	Understand the principle of frequency modulation and phase modulation.
CO 3	Study the functioning of radio receivers.
CO 4	Understand the fundamentals of the antenna, satellite and microwave techniques.
CO 5	Learn about the advanced communication technology such as DTH, 5G and FSO concepts.

MAPPING

CO \ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	M	L	L
CO 3	M	M	M	H	M
CO 4	H	M	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

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K. S. Rangasamy College of Arts & Science
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Namakkal-Dt. Tamil Nadu

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

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18UPHM202	CORE IV: OPTICS	SEMESTER – II

Course Objectives:

The course aims

- To provide a good foundation in optics.
- To inspire interest for the knowledge of concepts is physical and Geometrical optics.
- To provide knowledge about optical instruments.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Lens Aberrations:** Spherical aberration of a thin lens – Methods of reducing spherical aberration – Coma – Astigmatism – Curvature of the field – Distortion-chromatic aberrations in a lens – Condition for Achromatism of two thin lenses separated by a finite distances.	10	CO 1
II	**Interference:** Fresnel's biprism – Interference – Interference in thin film due to reflected light – Fringes due to wedge shaped thin film – Determination of diameter of a thin wire by air wedge – Michelson's Interferometer – Theory – Applications – Thickness of thin transparent material and resolution of spectral lines - Fabry Perot interferometer.	10	CO 2
III	**Diffraction:** Fresnel's and Fraunhofer diffraction – Fresnel's half period zones – Area of the half period zones – Zone plate – Comparison of zone plate with convex lens – Fraunhoffer diffraction pattern with N slits (diffraction grating) – Normal and oblique incidence – Absent and overlapping spectra of diffraction grating.	10	CO 3
IV	**Polarization:** Polarization – Nicol prism as polarizer and analyzer – Dichroic polarizer's – Huygens theory of double refraction in uniaxial crystals – Double image polarizing prisms – Quarter wave plate, Half-wave plate – Babinet's compensator – Production and detection of Plane, elliptically and circularly polarized light.	10	CO 4
V	**Photoelasticity:** Stress birefringence – Theory of photoelasticity – Stress-Optic law – Effect of a stressed model in a plane polariscope – Photo-Elastic bench – Application of photoelasticity.	10	CO 5

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...kkal-Dt. Tamil Nadu. INDIA

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

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

Text Books
1. *Subramaniam, N, Brij Lal* and *Avadhanula, M.N.* 2006. **A Book for study of Optics,** [First Edition]. S. Chand & Co. Pvt. Ltd., New Delhi. 2. *Palanisamy, P.K,* 2015. **Physics of Materials,** Scitech Publications Pvt. LtD, India.
Reference Books
1. *Murugeshan, R. and Kiruthiga Sivaprasath.* 2012. **Optics and Spectroscopy.** [Eighth Edition]. S. Chand & Co. Pvt. Ltd., New Delhi. 2. *Francis A Jenkins and Harvey E White.* 2011. **Fundamentals of Optics.** [Fourth Edition]. TMH, New Delhi. 3. *Ajay Ghatak.* 1998. **Optics.** Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Study about the aberrations takes place in different types of lenses.
CO 2	Comprehend the phenomenon of light can constructively and destructively in interference.
CO 3	Know about the basic concepts of diffractions of lights with experimental evidence.
CO 4	Obtain the characteristics of light waves in polarization phenomena.
CO 5	Know about the photoelasticity and its applications.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	M	M	L
CO 3	M	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

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K.S. RANGASAMY COLLEGE OF ARTS & SCIENCE (AUTONOMOUS) 27 CONTROLLER OF EXAMINATIONS TIRUCHENGODE

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.

18UPHM501	CORE VII: ELECTRICITY AND ELECTROMAGNETISM	SEMESTER – V

Course Objectives:

The course aims

- To impart knowledge on basic concepts of Electricity and Electromagnetism.
- To enhance the student's skill in basic concepts of Electrostatics, D.C circuits and AC circuits.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Electric Field:** Flux of electric field – Gauss's law (statement and proof) – Differential form of Gauss law – Application: Electric field due to uniformly charged sphere – Coulomb's theorem – Mechanical force experienced by unit area of a charged conductor – Deduction of Coulomb's inverse square law from Gauss's law. **Electric Potential:** Potential at a point due to point charge – Relation between electric field and electric potential – Electric potential energy – Potential at a point due to uniformly charged conducting sphere.	10	CO 1
II	**Electrostatics:** Capacitance - Principle - Types of capacitors - Capacitance of a Spherical, Cylindrical and Parallel plate capacitor - Effect of dielectric – Energy stored in a capacitor - Loss of energy due to sharing of charges - Force of attraction in parallel plate capacitor.	10	CO 2
III	**DC Circuit:** Growth and decay of current in resistance and inductance - Growth and decay of charge in resistance and capacitor - LCR circuit - Condition for the discharge to be oscillatory - Frequency of oscillation.	10	CO 3
IV	**Alternating Currents:** Peak average and RMS values of AC voltage and current - Power factor and current values in an AC circuit containing LCR (reactance and impedance) series and parallel resonant circuits - Power in an AC circuit - Wattless current - Choke coil - Construction and working of transformers (step up & down) - Energy losses and uses – Skin effect - Tesla coil.	10	CO 4
V	**Electromagnetism** : Ampere's circuital law – Magnetic field inside a long solenoid - Moving coil ballistic galvanometer -	10	CO 5

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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.

	Theory - Application to determine absolute capacity - Faraday's laws of electromagnetism - Lenz's law - Self-inductance and mutual inductance - Expression for self-inductance of a coil - Mutual inductance between two coils - Anderson's method - Absolute mutual inductance - co-efficient of coupling.		

Text Book

1. *Murugeshan, R.* 2017. **Electricity and Magnetism**. [10th Edition]. S. Chand & Co, New Delhi.

Reference Books

1. *Brijal and Subrahmanyam.* 1994. **A book for study of Electricity and Magnetism** [Twelfth Edition]. Ratan Prakashan Mandir educational and University Publishers, New Delhi.
2. *Jackson, J. D.* 1999. **Classical Electrodynamics.** [Third Edition]. BPB Publisher, New Delhi.
3. *Tiwari, K.K.* 1987. **Electricity and Magnetism** [First Edition]. S. Chand & Co., New Delhi.
4. *Richard J Fowler.* 1998. **Electricity: Principles and Applications**. [Fourth Edition]. Tata McGrawHill Publishing Company Ltd., New Delhi.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Obtain the fundamental properties of the electric charge and the electric potential within a framework of distributed symmetric charge distributions.
CO 2	Understand electrostatic charges and its application.
CO 3	Measuring the growth and decay of charges in various combination inductance, resistance and capacitor.
CO 4	Knowing the peak, average value of RMS in AC containing LCR circuits and its energy losses.
CO 5	Obtain the knowledge of electromagnetism.

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

Mr. M. PRASAD
K.S. Rangasamy College of Arts & Science
Tiruchengode - 637 215. Tamil Nadu. India.

18UPHSB301	SBC I: INSTRUMENTATION	SEMESTER – III

Course Objectives:

The course aims

- To provide a fundamental knowledge in measurements.
- To impart a knowledge on the functioning of the instruments

Credits: 2

UNIT	CONTENTS	Hrs.	CO
		Total Hours: 25	
I	**Basic Concept of Measurement:** Introduction – System configuration – Problem Analysis – Basic Characteristics of measuring devices – Calibration.	5	CO 1
II	**Measurement of Physical Quantities:** Force – Measuring Sensor – Pressure – Radiations – Load cell – Column – Type – Devices – Cantilever Beam – Torque Measurement – Absorption Type – Transmission Type – Stress Type – Deflection Type.	5	CO 2
III	**Input/Output Devices and Displays :** Introduction – Analog display and recorder – Graphic recorder – Optical oscillograph – Digital input – output devices – Punched card – Bar code – Line printer – Ink-Jet printer – Digital tape recording.	5	CO 3
IV	**Basic Meter Movements:** Permanent magnetic moving coil movements – Practical PMMC movements – Taut band instrument **Display Devices:** Light Emitting Diodes (LED) – Liquid Crystal Display (LCD) – Gas discharge Plasma displays – Segmental display LED's.	5	CO 4
V	**Digital Instruments:** Introduction – Digital Multi meter – Digital panel meters – Digital measurement of time – Universal counter – Digital pH Meter.	5	CO 5

Text Book

1. *C. S. Rangan, G. R. Sharma, V. S. V. Mani.* 2008. **Instrumentation Devices and Systems,** Tata McGraw-Hill Publishing Company Ltd, New Delhi.

Reference Books

1. *H. S. Kalsi.* 1995. **Electronic Instrumentation,** Tata McGraw-Hill Publishing Company Ltd, New Delhi.
2. *Anderson, Norman. A.* 2010. **Instrumentation for Process Management and Control.** [Third edition], CRC Press, Florida.

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

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

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

Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Obtain the basic knowledge of instrumentations and its troubleshooting problems.
CO 2	Describe the physical quantities of measurements.
CO 3	Identify the various types of basic functions of input; output based analog, digital and optical recording display devices.
CO 4	Explain about magnetic based moving coil instruments and light display diode devices.
CO 5	Operate modern electrical and electronic instruments and find faults and test various instrument.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	L	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

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

18UPHSBC401	SBC II: LASER PHYSICS	SEMESTER – IV

Course Objectives:

The course aims

- To provide a fundamental knowledge in LASERs.
- To impart a knowledge working of various LASERs and its applications.

Credits: 2 **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	**Fundamentals of LASER:** Spontaneous emission – Stimulated emission – Meta stable state – Population inversion – Pumping – Laser Characteristics – Einstein's relation.	5	CO 1
II	**Production of LASER:** Helium – Neon Laser – Ruby Laser – CO_2 Laser– Semiconductor Laser.	5	CO 2
III	**Industrial Applications of LASER:** Laser cutting – Welding – Drilling - Printing – Scanning – Holography – Recording and reconstruction of hologram.	5	CO 3
IV	**Lasers in Communication:** Optic fibre communication – Optical fibre and its types – Block diagram of fibre optic communication system – Advantages of fibre optic communication.	5	CO 4
V	**LASER in Medicine:** Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment – Imaging - laser safety and hazard.	5	CO 5

Text Book

1. *Avadhanulu, M. N. and Hemne P.S.* 2012. **An introduction to LASERS Theory and Applications.** [Second Edition]. S. Chand & Company, New Delhi.

Reference Books

1. *Silfvas, W.* 1996. **Laser Fundamentals**. [Second Edition], Cambridge University Press, London.
2. Thyagarajan K. and Ghatak. A.K.1939. **LASER Theory and Application.** Macmillan, India Ltd.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

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Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
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COURSE OUTCOMES (CO)

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

CO 1	Explain the basic principle of laser emission.
CO 2	Comprehend and explain the principles and design considerations of various (solid state and gas) lasers, modes of their operation.
CO 3	Describe the applications of laser in industries.
CO 4	Obtain the knowledge on applications of laser in medical field.
CO 5	Know the significance of modern lasers in communication networking system.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	H	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	H

H-High; M-Medium; L-Low

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18UPHSB501	SBC III: SPECTROPHYSICS	SEMESTER – V

Course Objectives:

The course aims

- To impart knowledge on principle, instrumentation and applications of various spectroscopy techniques.

Credits: 2 **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	**Electromagnetic Spectrum:** Types of spectra - Solar spectrum – Stellar spectrum Explanation of the Fraunhofer lines. **Ultraviolet Spectroscopy:** Discovery – Sources – Detecting devices – Spectrograph for UV region: Quartz spectrograph for near UV region – Vacuum Spectrograph for extreme UV region – Applications (Elementary ideas only).	5	CO 1
II	**Microwave Spectroscopy:** Rotation of molecules - Rotational spectra of diatomic molecules - Microwave spectrometer - Applications: Determination of Bond length - Determination of atomic mass.	5	CO 2
III	**Infrared Spectroscopy:** Vibrational energy of a diatomic molecule - Infrared spectra: Preliminaries - IR spectrometer - Sample handling techniques - Applications.	5	CO 3
IV	**Raman Spectroscopy:** Discovery of Raman Effect – Experimental study of Raman Effect – Characteristics of Raman lines – Quantum theory of Raman effect – Mutual exclusion principle – Applications of Raman spectroscopy.	5	CO 4
V	**NMR Spectroscopy:** Introduction – Theory of NMR – Experimental arrangement – NMR spectrum – Applications (Elementary ideas only). **ESR Spectroscopy:** Introduction – Theory of ESR – Instrumentation – ESR spectrum – Applications (Elementary ideas only).	5	CO 5

Text Book

1. *Aruldhas, G.* 2013. **Molecular Structure and Spectroscopy**, [Second Edition], PHI, New Delhi.
2. *Kiruthiga Sivaprasath and R Murugeshan.* 2006. **Optics and Spectroscopy**, [Sixth Revised Edition], S. Chand Publishing, New Delhi.

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K. S. Rangasamy College of Arts & Science
(Autonomous)
TIRUCHENGODE - 637 215
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K.S.RANGASAMY COLLEGE OF ARTS & SCIENCE CONTROLLER OF EXAMINATIONS TIRUCHENGODE-637 215

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

Reference Books
1. *Banwell. C.N.* 1972. **Fundamentals of Molecular Spectroscopy**, [Fourth Edition], Tata McGraw Hill, New Delhi. 2. *Gupta, S.L. Kumar, V. and Sharma. R.C.* 1993. **Elements of Spectroscopy**, [Ninth Edition], Pragathi Prakasahan, Meerut.
Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Understand the electromagnetic spectrum.
CO 2	Comprehend the microwave spectrum and its applications.
CO 3	Knowing the infrared spectroscopy and its applications.
CO 4	Knowing the Raman Effect and its applications.
CO 5	Understand the elementary ideas about NMR & ESR spectroscopy and its applications.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	M	L	L
CO 2	H	M	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	M
CO 5	M	M	M	L	L

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 (Autonomous)
Tiruchengode - 637 215, Tamilnadu, India.

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18UPHSB601	SBC IV: MATERIALS AND PROCESSING	SEMESTER – VI

Course Objectives:

The course aims

- To provide a basic knowledge about different kinds of materials.
- To inculcate the research thrust on processing of materials.

Credits: 2 **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	**Materials:** Material – Definition – Classification of materials – Functional materials – Characteristics of materials – Elasticity – Toughness, Ductility, Brittleness – Effect of heat treatment – Technological properties of metals.	5	CO 1
II	**Types of Materials:** Ferrous materials – Classification – Steels (carbon, alloy steels) – Nonferrous materials and their alloys (Cu, Mg, Ni, Al) – Materials for nuclear energy – ceramic materials, glass, polymers (qualitative only).	5	CO 2
III	**Testing of Materials:** Introduction – Destructive testing – Tensile testing – Hardness testing – Torsion test – Nondestructive testing – Radiography – Liquid penetrant test – Ultrasonic inspection – Corrosion testing.	5	CO 3
IV	**Heat Treatment Process:** Definition – Classification – Principles of heat treatment – Annealing – Quenching – Tempering – Ausforming – Maraging – Production and heat treating process of glass – Polymer processing.	5	CO 4
V	**Surface Treatment of Materials:** Introduction – Carburizing – Nitriding -Cyaniding – Carbonitriding – Hardening – Coating – Faced coatings – Weldings – Various welding processes – Process of soldering – Soldering alloys – Laser and Plasma surface treatment.	5	CO 5

Text Book

1. *Askeland, D.R. Pardeep. P. Fulay, D. K. Bhattacharya.* 2010. **Material Science and Engineering**, Cengage Learning , New Delhi .

Reference Books

1. *Agarwal. B. K.* 2003. **Introduction to Engineering Materials**, Tata McGraw Hill Publishing, New Delhi.
2. *Khanna, O. P.* 1996. **Material Science and Metallurgy**. Dhanpat Rai & Sons, New Delhi.

Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Analyze the materials properties in physics point of view.
CO 2	Knowledgeable of types of materials.
CO 3	Understand the importance methods of materials testing, heat treatment and surface analyzing.
CO 4	Obtain the heat treatment process to modify the microstructure and properties of materials.
CO 5	Knowing the various surface treatment processes to improve the surface characteristics of the materials.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	M	M	L
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	M
CO 5	M	M	M	M	L

H-High; M-Medium; L-Low

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CONTROLLER OF EXAMINATIONS

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