MANONMANIAM SUNDARANAR UNIVERSITY -TIRUNELVELI

UG **PROGRAMMES**

OPEN AND DISTANCE LEARNING(ODL) PROGRAMMES

(FOR THOSE WHO JOINED THE PROGRAMMES FROM THE ACADEMIC YEAR 2023–2024)

B.Sc. Physics

Semester	Course	Title of the Course	Course Code
II	Part I – Languages (Tamil)	தமிழ் இலக்கிய வரலாறு - II	J1TL21
	Part II – Languages (English)	General English – II	J2EN21
	Core - III	Heat, Thermodynamics and Statistical Physics	JMPH21
	Core - IV	Physics Practical - II	JMPHP2
	Elective – II	Vector Calculus and Fourier Series	JEMA21
	Skill Enhancement Course – II	Home Electrical Installation	JSPH21
	Skill Enhancement Course – III	Physics of Music	JSPH22

HEAT, THERMODYNAMICS and STATISTICAL PHYSICS

UNIT	DETAILS
I	**CALORIMETRY:** specific heat capacity – specific heat capacity of gases C_P and C_V – Meyer's relation – Joly's method for determination of C_V – Regnault's method for determination of C_P **LOWTEMPERATURE PHYSICS:** Joule –Kelvin effect – porous plug experiment – Joule –Thomson effect–Boyle temperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetisation.
II	**THERMODYNAMICS-I:** zeroth law and first law of thermodynamics – P-V diagram – heat engine – efficiency of heat engine – Carnot's engine, construction, working and efficiency of petrol engine and diesel engines – comparison of engines.
III	**THERMODYNAMICS-II:** second law of thermodynamics – entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram –thermodynamical scale of temperature – Maxwell's thermodynamical relations –Clasius- Clapeyron's equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.
IV	**HEAT TRANSFER:** modes of heat transfer: conduction, convection and radiation. *Conduction*: thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination of thermal conductivity of a bad conductor by Lee's disc method. *Radiation*: black body radiation (Ferry's method) – distribution of energy in black body radiation – Wien's law and Rayleigh Jean's law –Planck's law of radiation – Stefan's law – deduction of Newton's law of cooling from Stefan's law.
V	**STATISTICAL MECHANICS :** definition of phase – space – micro and macro states – ensembles – different types of ensembles – classical and quantum Statistics – Maxwell - Boltzmann statistics – expression for distribution function – Bose - Einstein statistics – expression for distribution function – Fermi-Dirac statistics –expression for distribution function – comparison of three statistics.
VI	**PROFESSIONAL COMPONENTS:** expert lectures – seminars – webinars – industry inputs – social accountability – patriotism.
Recommended Text	
1	Brijlal and N.Subramaniam, 2000, Heat and Thermodynamics, S.Chand and Co.
2	Narayanamoorthy and Krishna Rao, 1969, Heat, Triveni Publishers, Chennai.
3	V.R.Khanna and R.S.Bedi,1998 1st Edition,Text book of Sound, Kedharnaath Publish and Co, Meerut.
4	Brijlal and N.Subramanyam, 2001,Waves and Oscillations,Vikas Publishing House, New Delhi.
5	Ghosh, 1996, Text Book of Sound, S.Chand and Co.
6	R.Murugeshan and Kiruthiga Sivaprasath,Thermal Physics, S.Chand and Co.

PHYSICS PRACTICAL - II

HEAT, OSCILLATIONS, WAVES and SOUND

Minimum of Eight Experiments from the list:

1. Determination of specific heat by cooling – graphical method.
2. Determination of thermal conductivity of good conductor by Searle's method.
3. Determination of thermal conductivity of bad conductor by Lee's disc method.
4. Determination of thermal conductivity of bad conductor by Charlaton's method.
5. Determination of specific heat capacity of solid.
6. Determination of specific heat of liquid by Joule's electrical heating method (applying radiation correction by Barton's correction / graphical method),
7. Determination of Latent heat of a vaporization of a liquid.
8. Determination of Stefan's constant for Black body radiation.
9. Verification of Stefan's – Boltzmans law.
10. Determination of thermal conductivity of rubber tube.
11. Helmholtzresonator.
12. Velocity of sound through a wire using Sonometer.
13. Determination of velocity of sound using Kunds tube.
14. Determination of frequency of an electrically maintained tuning for k
15. To verify the laws of transverse vibration using sonometer.
16. To verify the laws of transverse vibration using Melde's apparatus.
17. To compare the mass per unit length of two strings using Melde's apparatus.
18. Frequency of AC by using sonometer.

VECTOR CALCULUS AND FOURIER SERIES

UNIT	DETAILS
I	Vector differentiation–Gradient–Divergence and curl.
II	Evaluation of double and triple integrals
III	Vector integration–Line, surface and volume integrals.
IV	Green‟s, Stoke‟s and Divergence theorems (without proof)– simple problems.
V	Fourier series–Even and odd functions–Half range Fourier series.
Recommended Text	
1	Dr.S. Arumugam & others- Allied Mathematics Paper-II ,New Gamma Publishing House, Palayamkottai, 2012.
2	T.K.Manicavachagom Pillai–Calculus (VolII), S.Vishvanathan Printer and Publisher PVT.LTD(2012)

HOME ELECTRICAL INSTALLATION

UNIT	COURSEDETAILS
I	**SIMPLE ELECTRICAL CIRCUITS: c**harge, current, potential difference, resistance – simple electrical circuits – DC ammeter, voltmeter, ohmmeter – Ohm's law – difference between DC and AC – advantages of AC over DC – electromagnetic induction – transformers – inductors / chokes – capacitors / condensers – impedance – AC ammeter, voltmeter –symbols and nomenclature.
II	**TRANSMISSION OF ELECTRICITY :** production and transmission of electricity – concept of power grid – Series and parallel connections – technicalities of junctions and loops in circuits – transmission losses (qualitative) – roles of step-up and step-down transformers – quality of connecting wires – characteristics of single and multi core wires.
III	**ELECTRICAL WIRING :** different types of switches –installation of two way switch – role of sockets, plugs, sockets -installation of meters – basic switch board – electrical bell – indicator – fixing of tube lights and fans – heavy equipment like AC, fridge, washing machine, oven, geyser, jet pumps – provisions for inverter – gauge specifications of wires for various needs.
IV	**POWER RATING AND POWER DELIVERED :** conversion of electrical energy in to different forms – work done by electrical energy – power rating of electrical appliances – energy consumption – electrical energy unit in kWh – calculation of EB bill – Joule's heating – useful energy and energy loss – single and three phase connections – Measures to save electrical energy – energy audit.
V	**SAFETY MEASURES:** insulation for wires – colour specification for mains, return and earth – Understanding of fuse and circuit breakers – types of fuse: kit-kat, HRC, cartridge, MCB, ELCB – purpose of earth line – lighting arrestors – short circuiting and over loading – electrical safety – tips to avoid electrical shock – first aid for electrical shock – fire safety for electric current.
Recommended Text	
1	Wiring a House: 5th Edition by Rex Cauldwell, (2014).
2	Black and Decker Advanced Home Wiring, 5th Edition: Backup Power - Panel Upgrades - AFCI Protection - "Smart" Thermostats, by Editors of Cool Springs Press, (2018).
3	Complete Beginners Guide to Rough in Electrical Wiring : by Kevin Ryan (2022).

PHYSICS OF MUSIC

UNIT	DETAILS
I	**SCIENTIFIC STUDY OF MUSIC:** vibrations of atoms of matter– vibrations coupling to air – propagation of sound waves in air, other media, fluids and solids – velocity, frequency, wavelength, time period, intensity: definition and units – classification of sound on frequency and velocity– human and animal sound perception– mechanism of ear and hearing – psychoacoustics.
II	**SIMPLE VIBRATING SYSTEMS:** simple harmonic motion –tuning fork– amplitude, phase, energy, energy loss/damping/ dissipation – power – travelling waves and standing waves– laws of vibration in stretched strings– one-dimensional medium – open and closed organ pipes – over tones, harmonics – quality of sound: pitch, timber, loudness – octaves, musical notes.
III	**MUSICAL TONE:** pure / simple tones – sine / cosine waves– well- defined frequencies, wavelengths, amplitudes and phases – partial tones – assembly of pure tones– mix of different frequencies and amplitudes– complex tone – superposition of simple tones – complex waveform – periodic complex wave form–formants–resonances– sound envelope.
IV	**PRODUCTION OF MUSICAL SOUNDS :** human voice, mechanism of vocal sound production – larynx (sound box) – *stringed Instruments*: plucked and bowed, guitar, mandolin, violin, piano, etc.– *wind instruments*: whistles, flute, saxophone, pipe organ, bagpipes, etc.– *percussion instruments*: plates, membranes, drums, cymbals, xylophoneetc. – *electronic instruments*: keyboards, electric guitars, rhythmpads, etc.–analog and digital sound synthesizers,–MIDI instrument–computer generated music.
V	**RECORDING OF MUSIC and SOUND:** Edison phonograph – cylinder and disk records – magnetic wire and tape recorders – digital recording (e.g. to CD, DVD, etc.)– analog transducers, condenser, dynamic microphones, loudspeaker – complex sound fields – near and far fields of acoustic –spectral analysis techniques–continuous and discrete Fourier transforms, digital signal processing – digital filtering – specifications of recording studios.
Recommended Text	
1	Physics and Music: The Science of Musical Sound by Harvey White (2014)
2	Good Vibrations – The Physics of Music by Barry Parker, (2009)
3	The History of Musical Instruments by Curt Sachs,(2006)
4	Physics and Music: Essential Connections and Illuminating Excursions by Kinko Tsuji and Stefan C. Müller(2021)