



Re-Accredited 'B++' 2.86 CGPA by NAAC

VEER NARMAD SOUTH GUJARAT UNIVERSITY

University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.

વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી

યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.

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-: પરિપત્ર :-

વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, NEP-2020 અંતર્ગત શૈક્ષણિક વર્ષ ૨૦૨૪-૨૫થી અમલમાં આવનાર S.Y.B.Sc.Physics Sem.- 3 Major, MDC અને SEC નો પેટાસમિતિ દ્વારા તૈયાર કરવામાં આવેલ અભ્યાસક્રમ ભૌતિકશાસ્ત્ર વિષયની અભ્યાસ સમિતિની તા.૦૪/૦૫/૨૦૨૪ ની સભાના ઠરાવ ક્રમાંક:૦૨ અન્વયે મંજૂર કરી કરેલ ભલામણ વિજ્ઞાન વિદ્યાશાખાના અધ્યક્ષશ્રીએ વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિદ્યાશાખાવતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૦૧/૦૩/૨૦૨૪ની સભાના ઠરાવ ક્રમાંક:૧૦૪ અન્વયે માન.કુલપતિશ્રીને આપેલ સત્તા અંતર્ગત ઈ.ચા.માનનીય કુલપતિશ્રી દ્વારા મંજૂર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

ભૌતિકશાસ્ત્ર વિષયની અભ્યાસ સમિતિની તા.૦૪/૦૫/૨૦૨૪ ની સભાના ઠરાવ ક્રમાંક:૦૨
:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ-૨૦૨૪-૨૫ થી અમલમાં આવનાર S.Y.B.Sc. Physics Sem.- 3 Major, MDC અને SEC નો પેટાસમિતિ દ્વારા તૈયાર કરવામાં આવેલ અભ્યાસક્રમ સર્વાનુમતે મંજૂર કરી તે મંજૂર કરવા વિજ્ઞાન વિદ્યાશાખાને ભલામણ કરવામાં આવે છે.

(બિડાણ: ઉપર મુજબ)

ક્રમાંક : એસ./સાયન્સ/પરિપત્ર/૧૦૦૬૩/૨૦૨૪
તા. ૧૩-૦૫-૨૦૨૪

W. J. S.
કુલસચિવ

પ્રતિ,

૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન તમામ કોલેજોનાં આચાર્યશ્રીઓ.

..... આપશ્રીની કોલેજના સંબંધિત શિક્ષકો/વિદ્યાર્થીઓને જાણ કરી અમલ કરવા સારું.

૨) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા.

૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....તરફ જાણ તેમજ અમલ સારું.

Veer Narmad South Gujarat University, Surat
Syllabus
For
B. Sc. Semester III
Physics (Major)(NEP-2020)
Effective from the Academic Year 2024-25

Paper: MJ-PH (TH) – 303 (2 Credits)

UNIT 1 Free and Forced Oscillations

Free oscillation (2.1), damped motion (2.2), energy of damped motion (2.3), forced oscillations and resonance (2.4), analysis of forced vibrations (2.5), analogy between mechanical and electrical quantities (2.6), amplitude and velocity resonances (2.7), power considerations in forced vibration and resonance (2.8), nature of resonance (2.9), phase relations in forced vibrations (2.10), comparison of amplitude and velocity resonances (2.11).

UNIT 2 AC Bridges and Charged Particles in Electromagnetic Fields

Impedance bridge (17.18), measurement of inductance (17.19) (a) Maxwell's impedance bridge, (b) Maxwell's LC bridge, (c) Owen's bridge, (d) Anderson's bridge, measurement of capacitance (17.21) (a) De Sauty's bridge, (b) Wien's bridge, (c) Schering bridge, measurement of frequency (low) (17.22).

Charged particles in crossed electric and magnetic fields (11.8) (i) velocity selector, (ii) Hall effect, (iii) e/m by Thomson method.

Reference books:

1. A treatise on Oscillations, waves and acoustics by D. Chattopadhyay, 1st Ed., Books and Allied (P) Ltd. 2016.
2. Electricity and Magnetism by D. C. Tayal, 4th Revised Ed., Himalaya Publishing House, India, 2019.

Faculty ની સહી
સહી A.C. ની યુજી સુધી લખાવવા ઇ.
(17.18)

Beja

Arutar

Arutar

Pharasi

Khanj

Practical: MJ-PH (PRA) – 303 (2 Credits)

Sr. No.	Title
1.	To study simple and damped harmonic motions.
2.	To study oscillations of a bar pendulum.
3.	To study coupled oscillator and its modes.
4.	To determine “Y” by the method of vibration.
5.	To determine self-inductance of an inductor using Maxwell’s bridge.
6.	To determine the ratio of capacitances using de Sauty’s bridge.
7.	To determine figure of merit of a BG.
8.	To find resonance frequency of an LCR ac series network.
9.	To determine Young’s modulus of a beam by the method of elevation.
10.	To determine moment of inertia of a flywheel.
11.	To find energy band gap of a semiconducting material.
12.	To verify Stefan’s fourth power law.

Reference Books:

1. D. C. Tayal, University Practical physics, Edited by Ila Agarwal, Himalayan Publishing House
2. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New Delhi.
3. D. P. Khandelwal, A Laboratory Manual of Physics for Undergraduate Classes, Vani Publication House, New Delhi.
4. Geeta Sanon, B. Sc. Practical Physics, 1st Ed. (2007), R. Chand & Co.

Note:

1. The duration of each experiment is of 2 hours.
2. There should not be more than 10 students per batch as per NEP 2020 guidelines.
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Bajaj

Humar

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Kharj

Paper: MJ-PH (TH) – 304 (2 Credits)

UNIT 1 Electronics I

Voltage sources (1.3), current sources (1.4), Thevenin's theorem (1.5), Norton's theorem (1.6).

Emitter bias (7.1), voltage-divider bias (7.5), accurate VDB analysis (7.6), VDB load line and Q point (7.7), two-supply emitter bias (7.8), other types of bias (7.9).

Base-biased amplifier (8.1), emitter-biased amplifier (8.2), small-signal operation (8.3), AC beta (8.4), AC resistance of the emitter diode (8.5), two transistor models (8.6), analyzing an amplifier (8.7).

UNIT 2 Physical Optics

Introduction (18.1), single slit diffraction pattern (18.2), diffraction by a circular aperture (18.3), resolving power of a microscope (18.5.1), the diffraction grating (18.8), the grating spectrum (18.8.1), resolving power of a grating (18.8.2), oblique incidence (18.9).

Introduction (22.1), Malus' law (22.2), the wire grid polarizer and the polaroid (22.3.1), polarization by reflection (22.3.2), polarization by double refraction (22.3.3), polarization by scattering (22.3.4), interference of polarized light: quarter wave plates and half-wave plates (22.6), optical activity (22.8).

Reference books:

1. Electronics Principles by A. P. Malvino, 8th Ed., Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1999.
2. Optics by Ajoy Ghatak 6th Ed., McGraw Hill Education (India) Pvt. Ltd. New Delhi, 2017.

Bajaj

Humar

Rajesh

Khan

Sunil

Practical MJ-PH (PRA) – 304 (2 Credits)

Sr. No.	Title
1.	To determine wavelength of spectral lines by plane transmission grating. (Minimum deviation method).
2.	To verify Malus' Law.
3.	To verify Brewster's Law.
4.	To determine the specific rotation of a solution by Laurent's half-shade polarimeter.
5.	To determine wavelength of lasers using diffraction grating.
6.	To determine Plank's constant using LED.
7.	To determine Cauchy's constants.
8.	To verify Thevenin's theorem.
9.	To verify Norton's theorem.
10.	To do VDB analysis for the CE configuration of a BJT.
11.	To determine Boltzmann's constant using PN junction diode.
12.	Study of Emitter-Biased Amplifier.

Reference Books:

1. D. C. Tayal, University Practical physics, Edited by Ila Agarwal, Himalayan Publishing House
2. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New Delhi.
3. D. P. Khandelwal, A Laboratory Manual of Physics for Undergraduate Classes, Vani Publication House, New Delhi.
4. Geeta Sanon, B. Sc. Practical Physics, 1st Ed. (2007), R. Chand & Co.

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3. In the external exam, a student will have to perform two experiments. The experiment will be of 2-hour duration.
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Bajaj

Arora Prakash
Singh

Chauhan

Paper: MJ-PH (TH) – 305 (4 Credits)

UNIT 1 Mathematical Physics

Complex variables:

Functions of complex variable (10), mapping (11), limits (12), theorems on limits (13), continuity (14), the derivative (15), differentiation formulas (16), the Cauchy-Riemann conditions (17), sufficient conditions (18), analytic functions (19), harmonic functions (20).

Fourier Series:

Definition (7.1), Dirichlet's condition (7.2), Graphical representation of a function (7.3), Extension of the interval (7.4), Complex form of Fourier series (7.5), Advantages of Fourier series (7.6), Properties of Fourier series (7.7).

UNIT 2 Wave Properties of Particles and Atomic Structure

de Broglie waves (3.1), waves of what? (3.2), describing a wave (3.3), phase and group velocities (3.4), particle diffraction (3.5), particle in a box (3.6), uncertainty principle-I (3.7), uncertainty principle-II (3.8)

The nuclear atom (4.1), electron orbits (4.2), atomic structure (4.3), the Bohr atom (4.4), energy levels and atomic spectra (4.5), correspondence principle (4.6), nuclear motion (4.7), atomic excitation (4.8).

UNIT 3 Kinetic Theory of Gases and Thermodynamics

Classical theory of heat capacities of gases (1.4), distribution of molecular velocities in a perfect gas (1.5), energy distribution of a Maxwellian gas (1.6), experimental verification of Maxwell's distribution law (1.7).

The Maxwell relations (8.2), thermodynamic relations involving heat capacities (8.3), the TdS equations (8.4), the energy equations (8.5), heat of reaction: Gibbs, Helmholtz equation (8.6).

UNIT 4 Nuclear Physics

Historical developments (1.2), proton-electron hypothesis (1.3.1), proton-neutron hypothesis (1.3.2), terms associated with the nucleus (1.3.3), quantitative facts about nucleus (1.4), size (1.4.1), mass (1.4.2), density (1.4.3), energy (1.4.4), charge (1.4.5), binding energy (1.5), mass defect (1.5.1), packing fraction (1.5.2), fusion and fission (1.5.3), binding energy per nucleon (1.5.4), nuclear angular momentum (1.6), nature of nuclear forces (1.9).

Sunil

Bajaj

Himanshu Puri

Khan

Reference books:

1. Complex variables and applications by R. V. Churchill, 2nd Ed. McGraw-Hill Book Co.
2. Mathematical Physics by B. S. Rajput, Pragati Prakashan, India, 2013.
3. Concepts of Modern Physics by A. Beiser, 6th Ed., McGraw-Hill Higher Education.
4. Thermal Physics by Garg, Bansal and Ghosh, 2nd Ed., McGraw Hill Education (India) Pvt. Ltd. Chennai, 2012.
5. Introduction to Nuclear and Particle Physics by Mittal, Verma and Gupta, 3rd Ed., PHI Learning Pvt. Ltd.

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Veer Narmad South Gujarat University, Surat
Syllabus

For

B. Sc. Semester III

Effective from the Academic Year 2024-25

Paper: MDC-PH (TH) – 301 (4 Credits)

Course Title: Energy Sources (Non-Renewable and Renewable)

Unit 1

Oil and natural gases: Introduction, crude oil reserves, natural gas reserves, recovering oil and gas, oil shell, tar sands, impact on environment.

Coal: Introduction, coal as a fossil fuel of the future, coal reserves, coal combustion for power generation, environmental impacts.

Unit 2

Nuclear Energy: Introduction, energy and mass, nuclear fission, chain reaction, critical mass, breeding process, nuclear fission reactor, fast breeder reactor, difficulties, safety and waste issues, about fuel reserves.

Unit 3

Solar Energy: Introduction, direct solar energy, use of direct energy, technology for converting solar energy to electricity.

Wind Energy: Introduction, the windmill and its working efficiency, advantages and disadvantages of windmill.

Unit 4

Tidal Energy: Introduction, types of tidal power generation system, power generation by tidal power, advantages and disadvantages of tidal power.

Geo-Thermal energy: Introduction, origin and nature of geothermal energy, geothermal energy extraction, geothermal fields in India, advantages disadvantages of geothermal energy.

Sumati

Bajaj

Mou

P. J. Jain

K. K. Nayak

Reference books:

1. Renewable Energy sources and their environmental Impact. by S Abbasi & Naseema Abbasi. [PHI] 2001.
2. Energy and Environment by E.H. Thorndike, Addison – Wesley 1976.
3. Energy, Resources and Policy by R.C. Dorf, Addison – Wesley 1978.
4. Energy by K. Parikh, The MacMillan Company of India, 1976.

Sundi

Hussan

Bajaj

Prakash

Kaush

Veer Narmad South Gujarat University, Surat
Syllabus

For

B. Sc. Semester III

Effective from the Academic Year 2024-25

Paper: MDC-PH (TH) – 302 (2 Credits)

Course Title: Optoelectronic Devices

Unit I:

Basics of semiconductor optics: Dual nature of light, band structure of various semiconductors, light absorption and emission, photoluminescence, electroluminescence, radioactive and non-radiative recombination, wave trains.

Structure and types of LEDs and their characteristics, guided waves and optical modes, optical gain, confinement factor, internal and external efficiency, semiconductor heterojunctions, double hetero structure LEDs.

Unit II:

Modulating light (direct modulation of laser diodes, electro-optic modulation, acousto-optic modulation), isolating light (magneto-optic isolators), inducing optical nonlinearity (frequency conversion, switching)

I-V characteristics of a p-n diode under illumination, photovoltaic and photoconductive modes, load line, photocells and photodiodes, PIN photodiodes, responsivity, noise and sensitivity, photodiode materials, electric circuits with photodiodes, solar cells.

Reference:

1. Semiconductor Optoelectronics: Physics and Technology by Jasprit Singh, McGraw Hill Companies.
2. Optoelectronics by E. Rosencher and B. Vinter, Cambridge Univ. Press.
3. Photonic Devices by J. Liu, Cambridge Univ. Press.
4. Semiconductor Optoelectronic Devices by P. Bhattacharya, 2nd Ed., Prentice Hall.

Suggested Online Link:

1. MIT Open Learning - Massachusetts Institute of Technology,
<https://openlearning.mit.edu/>
2. National Programme on Technology Enhanced Learning (NPTEL)
<https://www.youtube.com/user/nptelhrd>
3. Swayam Prabha - DTH Channel
https://www.swayamprabha.gov.in/index.php/program/current_he/8

Sumit

Himanshu

Bajaj

Piyasini

Kanani

Practical: MDC-PH (PRA) – 302 (2 Credits)

Sr. No.	Title
1.	To study characteristics of LED.
2.	To determine absorption coefficient of liquid using photo-cell.
3.	To determine stopping potential of a metal using photocell.
4.	To study characteristics of photocell.
5.	To find energy band gap of a semiconducting material.
6.	To determine Plank's constant using LED.
7.	To determine Boltzmann's constant using PN junction diode.
8.	To study solar cell.
9.	To study characteristics of PIN photodiode.
10.	To study LDR.

Note:

1. The duration of each experiment is of 2 hours.
2. There should not be more than 10 students per batch as per NEP 2020 guidelines.
3. In the external exam, a student will have to perform two experiments. The experiment will be of 2-hour duration.
4. There should be two examiners per batch in the external examination.
5. There should not be more than 10 students per examiner per session in the external examination.

Sumit

Anur

Bajaj

Piyasi

KRamy

Veer Narmad South Gujarat University, Surat
Syllabus

For

B. Sc. Semester III

Effective from the Academic Year 2024-25

Paper: MDC-PH (TH) – 303 (2 Credits)

Course Title: Numerical Analysis

Unit I:

Introduction (2.1), the bisection method (2.2), the method of false position (2.3), the iteration method (2.4), Newton-Raphson method (2.5), Ramanujan's method (2.6).

Unit II:

Introduction (3.1), errors in polynomial interpolation (3.2), finite differences (3.3), forward differences (3.3.1), backward differences (3.3.2), central differences (3.3.3), symbolic relations and separation of symbols (3.3.4), detection of errors by use of difference tables (3.4), differences of a polynomial (3.5), Newton's formula for interpolation (3.6) Divided differences and their properties (3.10), Newton's general interpolation formula (3.10.1).

Reference books:

1. Introductory Methods of Numerical Analysis by S. S. Sastry, PHI publication, 4th Ed.
2. Numerical Analysis by G. Shanker Rao, New Age International Publication, 3rd Ed.

Sunil

Bejaj

Amur

Rajani

Hansl

Practical: MDC-PH (PRA) – 303 (2 Credits)

Sr. No.	Title
1.	Find the real roots of the given equation using bisection method.
2.	Find the real roots of the given equation using method of false position.
3.	Find the real roots of the given equation using iteration method.
4.	Find the real roots of the given equation using Newton-Raphson method.
5.	Find the real roots of the given equation using Ramanujan's method.
6.	Make a forward difference table for the given set of data.
7.	Make a backward difference table for the given set of data.
8.	Newton's forward interpolation formula.
9.	Newton's backward interpolation formula.
10.	Newton's general interpolation formula.

Note:

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Sunil

Arun Bajaj

P. Rajan

K. Ravi

Veer Narmad South Gujarat University, Surat
Syllabus

For

B. Sc. Semester III

Effective from the Academic Year 2024-25

Paper: SEC-PH (PRA) – 301 (2 Credits)

Course Title: Programming in “C” Language

Total Hrs: 60 (Practical)

Develop algorithm, flow chart and program to study the following problems:

Sr. No.	Practical
1	One dimensional dynamics of motion of falling objects (ideal case)
2	One dimensional dynamics of motion of falling objects (considering drag force)
3	One dimensional dynamics of an oscillator (spring) without damping.
4	One dimensional dynamics of an oscillator (spring) with damping.
5	Motion of an accelerating car (constant acceleration)
6	Motion of an accelerating car (a matter of Horse Power)
7	Motion of an accelerating car (considering Air resistance and Rolling friction)
8	Motion of an accelerating car (effect of shifting of gears)
9	Project work (equivalent to 4 experiments)

Text Books:

1. ANSI C by E Balaguruswamy, TATA McGraw-Hill Publication
2. Introduction to Computational Physics, Marvin L Dejong, Addison Wesley Longman Publishing Co.

Note:

1. The duration of each experiment is of 2 hours.
2. There should not be more than 10 students per batch as per NEP 2020 guidelines.
3. In the external exam, a student will have to perform one experiment and there will be project viva also. The duration of external evaluation will be of 4 hours.
4. There should be two examiners per batch in the external examination.
5. There should not be more than 10 students per examiner per session in the external examination.

Sumita

Hussain

Bajaj

P. J. Joshi

K. K. Kulkarni

Veer Narmad South Gujarat University, Surat

Syllabus

For

B. Sc. Semester III

Effective from the Academic Year 2024-25

Paper: SEC-PH (PRA) – 302 (2 Credits)

Course Title: Basic Electronic Circuit Designing

Total Hrs: 60 (Practical)

The experiments are to be performed in “To Design, Build and Test” mode.

Sr. No.	Title
1	Kirchhoff's Voltage Law.
2	Kirchhoff's Current Law.
3	Superposition theorem.
4	Thevenin's theorem.
5	Norton's theorem.
6	PN junction diode (forward and reversed bias).
7	Voltage regulator using Zener diode.
8	Half-wave and full-wave rectifiers with L and π filters.
9	Bridge rectifier with L and π filters.
10	Basic logic gates and verify their truth tables.
11	Universal gates and verify their truth tables.
12	Ex-OR Gate and verify its truth table.
13	Half adder and full adder (using logic gates).
14	Half subtractor and full subtractor (using logic gates).
15	Transistor as a switch.

Note:

1. The students will have to design, build and test these circuits on either a PCB or a breadboard.
2. The duration of each experiment is of 4 hours (2 hours for designing and 2 hours for testing).
3. There should not be more than 10 students per batch as per NEP 2020 guidelines.
4. In the external exam, a student will have to perform one experiment of 4 hours (2 hours for designing and 2 hours for testing) duration.
5. There should be two examiners per batch in the external examination.
6. There should not be more than 10 students per examiner per session in the external examination.

Sumita

Anu

Balraj

Pooja

Kaavya

Veer Narmad South Gujarat University, Surat
Syllabus

For

B. Sc. Semester III

Effective from the Academic Year 2024-25

Paper: SEC-PH (PRA) – 303 (2 Credits)

Course Title: Instrumentation (Laboratory Skills)

Total Hrs: 60 (Practical)

Sr. No.	Practical
1	To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2	To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3	To measure Q of a coil and its dependence on frequency, using a Q- meter.
4	Measurement of voltage, frequency, time period and phase angle using CRO.
5	Measurement of time period, frequency, average period using universal counter/ frequency counter.
6	Measurement of rise, fall and delay times using a CRO.
7	Measurement of distortion of a RF signal generator using distortion factor meter.
8	Measurement of R, L and C using a LCR bridge/universal bridge.
9	Project Work (equivalent to 4 experiments)

References:

1. A text book in Electrical Technology - B L Theraja - S Chand and Co.
2. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
3. Electrical and Electronic Measurements and Instrumentation by A. K. Sawhney, Dhanpat Rai & Co, 19th Ed.

Note:

1. The duration of each experiment is of 2 hours.
2. There should not be more than 10 students per batch as per NEP 2020 guidelines.
3. In the external exam, a student will have to perform one experiment and there will be project viva also. The duration of external evaluation will be of 4 hours.
4. There should be two examiners per batch in the external examination.
5. There should not be more than 10 students per examiner per session in the external examination.

Sumita

Huma

Bajaj

Rajani

Kanoy