Shri Acharyaratna Deshbhooshan Shikshan Prasarak Mandal, Kolhapur

Mahavir Mahavidyalaya, Kolhapur (Autonomous)

Affiliated to Shivaji University, Kolhapur

Syllabus for Choice Based Credit System (NEP 2020)
Bachelor of Science (B. Sc.) Programme

Part	I	Course	Physics

Under the Faculty of Science & Technology

(To be introduced from Academic Year 2024 – 25 onwards)

Subject to the revisions& modifications made from time to time

Mahavir Mahavidyalaya, Kolhapur (Autonomous)
Affiliated to Shivaji University, Kolhapur

(New syllabus under Autonomy to be introduced from June, 2024 onwards)

Primary Information:			
Programme	**Bachelor of Science (B. Sc.) NEP**		
Part	**I**	Semester	**I**
Course	**Physics**	Course Code	**OE 01**
Paper No.	**I**	Course Type	**Semester**
Total Marks	**50 Marks**	Implementation	**2023 – 24**
Total Credits	**02**	Contact Hours	**05 / Week**
Course Title	**गृह उपयोगी इलेक्ट्रिकल जोडणी**		

Course Objectives:	
i)	To understand the basics of electricity.
ii)	To get knowledge about electrical wiring.

Course Syllabus
(CR = Credits / IH: Instructional Hours)

Units	**CR**	**IH**
1. विद्युत सुरक्षा खबरदारी आणि साधने : दुकानातील विजेची आग लागण्याची कारणे आणि विजेचा शॉक, विद्युत आग आणि विद्युत शॉक टाळण्यासाठी खबरदारी, इलेक्ट्रिकल कॉमन हँड्स टूल्स, साधनांचा सुरक्षित वापर इलेक्ट्रॉनिक आणि इलेक्ट्रिकल कंपोनंट्सचे सिम्बॉल. **2. विजेची मूलभूत माहिती :** ए.सी. (वैकल्पिक) आणि डी.सी. (थेट) व्होल्टेज आणि करंट (विद्युतप्रवाह) ओळख, ए.सी. आणि डी.सी. व्होल्टेज मधील फरक आणि करंट (विद्युतप्रवाह), ओहमचा नियम डी.सी. पुरवठ्यातील सेरीज आणि पॅरलल जोडणी **3. विद्युत वायरिंग 1 :**	02	30

वायरिंगसाठी लागणाऱ्या साहित्याची माहिती (बटन, प्लग, फ्युज, इंडिकेटर, टेस्टर), वेगवेगळ्या प्रकारच्या वायर्स, सिंगल फेज इलेक्ट्रिकल वायरिंग: टेबल लॅम्प जोडणी एक्सटेन्शन बोर्ड जोडणी. **4. विद्युत वायरिंग 2 :** इलेक्ट्रिकल बोर्ड जोडणी: i) 2 प्लग, 2 बटन, फ्युज, इंडिकेटर ii) 4 प्लग, 4 बटन, फ्युज, इंडिकेटर iii) 4 प्लग, 4 बटन, फॅन डीमर		

Course Outcomes:
On completion of the course, students will be able to:
i) Explain the basics of electricity.
ii) Explain electrical wiring & board connections.

Primary Information:			
Programme	**Bachelor of Science (B. Sc.) NEP**		
Part	**I**	Semester	**II**
Course	**Physics**	Course Code	**OE 02**
Paper No.	**II**	Course Type	**Semester**

Total Marks	**50 Marks**	Implementation	**2024 – 25**
Total Credits	**02**	Contact Hours	**05 / Week**
Course Title	**गृह उपयोगी इलेक्ट्रिकल आणि इलेक्ट्रॉनिक उपकरणे**		

Course Objectives:	
i)	To understand the basic knowledge about electrical & electronic instruments.
ii)	To understand the testing & repairing of electrical & electronic instruments.

Course Syllabus
(CR = Credits / IH: Instructional Hours)

Units	CR	IH
1. **इलेक्ट्रिकल आणि इलेक्ट्रॉनिक उपकरणे – 1** इलेक्ट्रिकल आणि इलेक्ट्रॉनिक फ्लोरोसेंट ट्यूब जोडणी, सजावट एलईडी दिवे आणि माळा, इलेक्ट्रिकल आणि इलेक्ट्रॉनिक फॅन डीमर, हेअर ड्रायर, कम्प्युटर माऊस आणि कीबोर्ड, इलेक्ट्रिक गन, रिमोट, वॉच, मोबाईल चार्जर, कॅल्क्युलेटर, इलेक्ट्रिकल आणि इलेक्ट्रॉनिक बेल. 2. **इलेक्ट्रिकल आणि इलेक्ट्रॉनिक उपकरणे – 2** विविध प्रकारचे टॉर्च (चाचणी आणि दुरुस्ती), इलेक्ट्रिकल आणि इलेक्ट्रॉनिक इस्त्रीचे प्रकार, इलेक्ट्रिकल आणि इलेक्ट्रॉनिक इस्त्रीची रचना आणि कार्यतत्व, इस्त्रीमधील सामान्य दोषांची चाचणी आणि दुरुस्ती, विविध प्रकारची इलेक्ट्रिकल व इलेक्ट्रॉनिक्स खेळणी 3. **इलेक्ट्रिकल आणि इलेक्ट्रॉनिक उपकरणे – 3** सिलिंग आणि टेबल फॅनची रचना आणि कार्य करण्याचे सिद्धांत, सीलिंग फॅन वायरिंग प्रणाली बसवणे, सामान्य समस्या आणि त्यांचे उपाय, सीलिंग फॅन डीमर चाचणी, सामान्य समस्या आणि त्याचे उपाय ए.सी. आणि डी.सी. विद्युत पुरवठा यंत्र रचना (चाचणी आणि दुरुस्ती).	02	30

4. **इलेक्ट्रिकल आणि इलेक्ट्रॉनिक उपकरणे – 4** टेबल फॅनची रचना आणि कार्य करण्याचे सिद्धांत, टेबल फॅनची वायरिंग प्रणाली, सामान्य समस्या आणि त्याचे उपाय, इलेक्ट्रिकल शेगडीची रचना आणि कामाचे सिद्धांत, हॉट प्लेट गिझर रचना व कार्यप्रणाली, वापर आणि दुरुस्ती, सामान्य समस्या आणि त्यांचे उपाय.		

Course Outcomes:
On completion of the course, students will be able to:
i) Explain the basic knowledge about electrical & electronic instruments.
ii)Explain the testing & repairing of electrical & electronic instruments.

Practical Course

Course Objectives:
1. Learn to do electrical board connections.
2. Learn to test & repair different electrical & electronic instruments.

Course Syllabus
(CR = Credits / IH: Instructional Hours)

प्रात्यक्षिक	**CR**	**IH**
प्रात्यक्षिक I	02	30

1. विविध इलेक्ट्रिकल व इलेक्ट्रॉनिक कंपोनंटचे सिम्बॉल ओळखणे व रेखाटने. 2. डी.सी. पुरवठ्यासाठी सिरीज आणि पॅरेलल जोडणी करणे व जोडणी नुसार सिद्धता करणे. 3. टेबल लॅम्प जोडणी करणे. 4. एक्सटेंशन बोर्ड जोडणी करणे. 5. इलेक्ट्रिकल बोर्ड जोडणी: 2 प्लग, 2 बटन, फ्युज, इंडिकेटर 6. इलेक्ट्रिकल बोर्ड जोडणी: 4 प्लग, 4 बटन, फ्युज, इंडिकेटर 7. इलेक्ट्रिकल बोर्ड जोडणी: 4 प्लग, 4 बटन, फॅन डीमर		
प्रात्यक्षिक **II** 1. ए.सी. आणि डी.सी. विद्युत पुरवठा यंत्र तयार करणे. 2. टेबल लॅम्प आणि ट्यूबलाईट जोडणी 3. इलेक्ट्रिकल इस्त्रीची चाचणी आणि दुरुस्ती 4. इलेक्ट्रिकल बेल (विजेची घंटा) चाचणी आणि दुरुस्ती 5. आपत्कालीन टॉर्च (विजेरी) चाचणी आणि दुरुस्ती 6. हेअर ड्रायर चाचणी आणि दुरुस्ती 7. कॉम्प्युटर माऊस कीबोर्ड चाचणी आणि दुरुस्ती 8. इलेक्ट्रिकल स्टोअरची (शेगडी) चाचणी आणि दुरुस्ती	02	30

Course Outcomes:
• On completion of this course students will be expected to:
1) Do electrical board connections.
2) Test & repair different electrical & electronic instruments.

Books for Reference	
1.	इलेक्ट्रिक वायरिंग - ओ. बी. चौधरी
2.	इलेक्ट्रिक वायरिंग - इलेक्ट्रिक टेक्नॉलॉजी - ओ. बी. चौधरी
3.	इलेक्ट्रिकल आणि इलेक्ट्रॉनिक तंत्रज्ञानाचे घटक - श्री. जी. व्ही. गोटमारे
4.	Basic Electrical Engineering (with lab manual) (Marathi) एस. के. सहदेव
Books for Practical	
1.	इलेक्ट्रिक वायरिंग - ओ. बी. चौधरी
2.	इलेक्ट्रिक वायरिंग - इलेक्ट्रिक टेक्नॉलॉजी - ओ. बी. चौधरी
3.	इलेक्ट्रिकल आणि इलेक्ट्रॉनिक तंत्रज्ञानाचे घटक - श्री. जी. व्ही. गोटमारे
4.	Basic Electrical Engineering (with lab manual) (Marathi) एस. के. सहदेव

Suggested methods of Teaching:	
i)	Offline Traditional Board Teaching
ii)	Power Point Presentation
iii)	Online Teaching on platform of Zoom or Google Meet

Scheme of Course Evaluation		
1.	End Semester Examination (ESE)	40
2.	Continuous Internal Evaluation (CIE)	10
3.	**Total Marks**	**50**

Suggested techniques for Continuous Internal Evaluation (10 Marks)	
1.	Seminar
2.	Field Report
3.	Assignments
4.	Open book test
5.	Offline / online MCQ test
6.	Symbolic test
7.	Oral
8.	Surprise test
9.	Formula Test
10.	Attendance

Question Paper Pattern (40 Marks) Theory Exam		
Q. No.	**Nature / Type of Question**	**Marks**
1.	Multiple Choice Questions (MCQ) 6 Questions	**6 Marks** (1 Marks for each question)
2.	Write the answers in short 5 Questions	**10Marks** (2 Marks for each question)
3.	Write short notes Attempt any 3 out of 5 questions	**12Marks** (4 Marks for each question)
4.	Write descriptive questions Attempt any 2 out of 4 questions	**12 Marks** (6 Marks for each question)

5.	**Total**	**40 Marks**

Practical Examination

(A) The practical examination will be conducted on one day for three hours per day per batch of the practical examination.

(B) Each candidate must produce a certificate from the Head of the Department in her/his college, stating that he/she has completed in a satisfactory manner the practical course on lines laid down from time to time by Academic Council on the recommendations of Board of Studies and that the journal has been properly maintained. Every candidate must have recorded his/her observations in the laboratory journal and have written a report on each exercise performed. Every journal is to be checked and signed periodically by a member of teaching staff and certified by the Head of the Department at the end of the semister. Candidates must produce their journals at the time of practical examination.

Question Paper Pattern (50 Marks) **Semisterwise Practical Exam**		
Semister	**Nature / Type of Question**	**Marks**
III	Experiment 1 Experiment 2 Certified Journal (05 marks) Oral (05 marks)	**20** **20** **10**
	Total Marks (For Semister III)	**50**
IV	Experiment 1 Experiment 2	**20** **20**

	Certified Journal (05 marks) Oral (05 marks)	**10**
	Total Marks (For Semister IV)	**50**
Total Marks		**100**

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Syllabus for Choice Based Credit System (NEP 2020)
Bachelor of Science (B. Sc.) Programme

Part	I	Course	Physics

Under the Faculty of Science & Technology

(To be introduced from Academic Year 2024 – 25 onwards)

Subject to the revisions & modifications made from time to time

Mahavir Mahavidyalaya, Kolhapur (Autonomous)
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(New syllabus under Autonomy to be introduced from June, 2024 onwards)

Primary Information:			
Programme	**Bachelor of Science (B. Sc.) NEP**		
Part	**I**	Semester	**I**
Course	**Physics**	Course Code	**DSC-A1**
Paper No.	**I**	Course Type	**Semester**
Total Marks	**50 Marks**	Implementation	**2024 – 25**
Total Credits	**02**	Contact Hours	**04 / Week**
Course Title	**Mechanics I**		

Course Objectives:	
i)	Learn scalar, vector, derivatives.
ii)	Study Newton's laws of motion.
iii)	Study conservation of energy, centre of mass.
iv)	Study rotational motion & moment of inertia of various bodies.

Course Syllabus
(CR = Credits / IH: Instructional Hours)

Modules	**CR**	**IH**
Module I : **Unit I - Vector:** Scalar and vector product, Derivatives of a vector with respect to parameter (velocity & acceleration). **Unit II -** **A) Ordinary Differential Equation:** Differential Equation- Ordinary & partial differential equation, 1st order homogeneous differential equation, 2nd order homogeneous differential equation with constant coefficients. **B) Laws of motion:** Introduction, frame of reference, Inertial & Non-inertial frame of reference, Newton's laws of motion and their proof.	01	15

Module II :		
Unit I - Rotational motion: Introduction, Angular velocity, angular momentum, angular displacement, angular acceleration and torque, System of particle-Centre of mass, Moment of Inertia (in short). **Unit II - Dynamics of a system of particles:** Conservation of linear and angular momentum, work and energy theorem, conservation of energy (single particle), Dynamics of system of particles (linear momentum, angular momentum and energy), Centre of mass.	01	15

Course Outcomes:
On completion of the course, students will be able to:
i) Understand concept of scalar, vector and their product.
ii) Understand difference between partial and ordinary differential equations.
iii) Understand rotational motion and moment of inertia of various bodies.

Primary Information:			
Programme	**Bachelor of Science (B. Sc.) NEP**		
Part	**I**	Semester	**I**
Course	**Physics**	Course Code	**DSC-A2**
Paper No.	**II**	Course Type	**Semester**
Total Marks	**50 Marks**	Implementation	**2024 – 25**
Total Credits	**02**	Contact Hours	**04 / Week**
Course Title	**Electricity & Magnetism I**		

Course Objectives:	
i)	To study the gradients, divergence, curl and their physical significance.
ii)	To study the Electrostatics field, Electrostatics theorem & electrolytic capacitors.
iii)	To study dielectric medium and three electric vectors.

Course Syllabus
(CR = Credits / IH: Instructional Hours)

Modules	CR	IH
Module I: **Unit I - Vector Analysis :** Vector algebra, Gradient, divergence, Curl and their significance, Vector Integration, surface and volume integrals of vector fields, divergence theorem and stokes theorem of vectors (statement only). **Unit II –** **Electrostatics I :** Electrostatics field, Electric flux, Gauss's theorem of electrostatics, electric potential as line integral of electric field, potential due to charge ,electric dipole, uniformly charged spherical shell and solid sphere, calculation of electric field from potential.	01	15

Module II :		
Unit I – Electrostatics II : Capacitance of an isolated spherical conductor parallel plate, spherical and cylindrical condenser, energy per unit volume in electrostatic field. **Unit II – Dielectrics :** Polarisation of dielectric and polarisation vector, displacement vector, electric vector, relation between E, P and D vectors, electric susceptibility of dielectrics.	01	15

Course Outcomes:
After completion of the unit, students will be able to:
i) Understand significance of gradient, divergence and curl.
ii) Calculate electrostatics field and potential of charge distribution using Gauss's law.
iii) Understand the relation between three electric vector

Primary Information:			
Programme	**Bachelor of Science (B. Sc.) NEP**		
Part	**I**	Semester	**II**
Course	**Physics**	Course Code	**DSC-B1**
Paper No.	**III**	Course Type	**Semester**
Total Marks	**50 Marks**	Implementation	**2024 – 25**
Total Credits	**02**	Contact Hours	**04 / Week**
Course Title	**Mechanics II**		

Course Objectives:	
i)	To study Gravitation.
ii)	To study oscillations.
iii)	To study types of pendulum.
iv)	To study surface tension.

Course Syllabus
(CR = Credits / IH: Instructional Hours)

Modules	CR	IH
Module I :	01	15
Unit I - Gravitation : Newton's law of Gravitation, Motion of particle in central force field, Satellite in a circular orbit, Geosynchronous orbits, Basic idea of GPS. **Unit II - Oscillations :** SHM, types of oscillation, differential equation of SHM, Energy of SHM, solution for equation of SHM, Compound pendulum, Kater's pendulum, Bessel's formula, bifilar pendulum.		

Module II:		
Unit I – Elasticity : Bending of beam, bending moment, cantilever (without considering weight of cantilever), beam supported at both ends (without considering weight of beam). **Unit II - Surface Tension :** Surface tension, angle of contact and wettability, relation between surface tension, excess of pressure and radius of curvature, experimental determination by Jaegers method, Applications of Surface tension.	01	15

Course Outcomes:
After completion of the unit, students will be able to:
i) Understand oscillations, gravitation, pendulums.
ii) Understand elasticity and surface tension.

Primary Information:			
Programme	**Bachelor of Science (B. Sc.) NEP**		
Part	**I**	Semester	**II**
Course	**Physics**	Course Code	**DSC-B2**
Paper No.	**IV**	Course Type	**Semester**
Total Marks	**50 Marks**	Implementation	**2024 – 25**
Total Credits	**02**	Contact Hours	**04 / Week**
Course Title	**Electricity & Magnetism II**		

Course Objectives:	
i)	To study Growth and decay of current.
ii)	To study LCR series circuit and AC bridge.
iii)	Understand magnetic properties of materials.
iv)	Learn electromagnetic induction laws.

Course Syllabus
(CR = Credits / IH: Instructional Hours)

Modules	CR	IH
Module I :		
Unit I – Magnetism I : Magnetostatic : Bio-Savart's law and its application, Straight conductor, circular coil, solenoid carrying current, Divergence and Curl of Magnetic field, Magnetic Vector potential, Ampere's circuital law, **Unit II - Magnetism II :** Magnetic properties of materials, Magnetic intensity, Magnetic induction, Permeability, Magnetic susceptibility, Brief introduction of dia- magnetic, para- magnetic and ferro-magnetic materials.	01	15

Module II :		
Unit I – Electromagnetic Induction : Faraday's laws of electromagnetic induction, Lenz's law, Self and mutual inductance, Self inductance of single coil, Mutual inductance of two coils, Energy stored in magnetic field. **Unit II – A.C. Circuits :** Complex numbers and their application in solving AC series LCR circuit, Complex Impedance, Reactance, Admittance and Susceptance, Resonance in series LCR circuit, Sharpness of resonance (qualitative treatment only), Q factor(definition), AC Bridge- Owen's Bridge.	01	15

Course Outcomes:
After completion of the unit, students will be able to:
i) Define Complex Impedance, Reactance, Admittance and Susceptance, Resonance.
ii) Learn application of Biot-Savart law in straight conductor, circular coil and solenoid.
iii) Determine energy stored in magnetic field.

Practical Course

Course Objectives:
1. Learn measuring skills in practical.
2. To make the students aware about handling of instruments .
3. To make them aware of basic components.

Course Syllabus (CR = Credits / IH: Instructional Hours)		
SEMISTERS	**CR**	**IH**
SEM I	02	
GROUP A - 1) Measurements of length using vernier calliper, screw gauge and travelling microscope. 2) Moment of Inertia of a disc using auxiliary ring. 3) Moment of Inertia of a flywheel. 4) Determine g by Bar pendulum. 5) Determine g by Kater's pendulum. 6) Study exponential decay of amplitude of simple pendulum 7) To study the motion of a spring and calculate a) Spring Constant b) value of g. GROUP B – 1) Testing of component. 2) To use a Multimeter for measuring a)Resistance b)AC and DC voltage c)DC current d) Checking electrical fuses. 3) Thevenin /Norton theorem. 4) Measurement of constant of B.G. 5) Compare capacitance using De'Sauty's bridge (B.G./ Spot galvanometer) 6) High resistance by Leakage Method.		

SEM II		
GROUP A - 1) Surface Tension by Jaeger's method. 2) Young's modulus of a material of Bar by vibration. 3) Modulus of rigidity of material of wire by torsional oscillation. 4) Poission's ratio for using rubber tube. 5) Y/η of wire by Searle's method. 6) To level the prism table using spirit level & optical method & hence determine angle of prism using spectrometer. GROUP B - 1) Impedance of series LCR. 2) Series LCR circuit and determine it's a)Resonant Frequency b) Quality factor Q. 3) Parallel LCR circuit and determine it's a)Anti-resonant Frequency b) Quality factor Q. 4) Frequency of A.C.mains by Sonometer. 5) Determine low resistance by Carey Foster's bridge. 6) Measurement of field strength B and its variation in a Solenoid (determine dB/dx).	02	

Course Outcomes:
• On completion of this course students will be expected to:
1) Learn measuring skills in practical.
2) Understand theoretical concepts by performing experiments.
3) To handle various instruments.
4) Develop awareness of minimizing errors

Text Books for Reading	
1.	Phadke Prakashan
2.	Nirali Prakashan
Books for Reference	
1.	Principles of physics-walker, Holiday, Resnick, 10th edition.
2.	Physics-S.G sterling and Woodal, Longmans & Green Co.Ltd.
3.	Mechanics- Berkely physics course, Charles kittle, Tata Mc Graw Hill publication.
4.	Mathematical physics- Hobson M.P, Bence S.J., Cambridge university press, 3rd edition, 2006.
5.	Electricity & Magnetism :D.C.Tayal, Himalaya publishing House,1988
6.	Concepts of physics Vil-2 H.C.Verma.
7.	Electromagnetics- B.B Laud.
8.	Electricity and Magnetism: J.H Fewkes and John yarhood, Vol I, publication by Oxford university press, 5th edition.
Books for Practical	
1.	A text book of practical physics-Shrinivasan and Balasubramanyam.
2.	Practical physics-Gupta and kumar (pragatiprakationMeerat)
3.	Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House.
4.	Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4thEdition, reprinted 1985, Heinemann Educational Publisher
5.	Engineering Practical Physics, S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd.

Suggested methods of Teaching:	
i)	Offline Traditional Board Teaching
ii)	Power Point Presentation
iii)	Online Teaching on platform of Zoom or Google Meet

Scheme of Course Evaluation		
1.	End Semester Examination (ESE)	40
2.	Continuous Internal Evaluation (CIE)	10
3.	**Total Marks**	**50**

Suggested techniques for Continuous Internal Evaluation (10 Marks)	
1.	Seminar
2.	Field Report
3.	Assignments
4.	Open book test
5.	Offline / online MCQ test
6.	Symbolic test
7.	Oral
8.	Surprise test
9.	Formula Test
10.	Attendance

Question Paper Pattern (40 Marks) Theory Exam		
Q. No.	**Nature / Type of Question**	**Marks**
1.	Multiple Choice Questions (MCQ) 6 Questions	**6 Marks** (1 Marks for each question)
2.	Write the answers in short 5 Questions	**10Marks** (2 Marks for each question)
3.	Write short notes Attempt any 3 out of 5 questions	**12Marks** (4 Marks for each question)
4.	Write descriptive questions Attempt any 2 out of 4 questions	**12 Marks** (6 Marks for each question)
5.	**Total**	**40 Marks**

Practical Examination

(A) The practical examination will be conducted on one day for three hours per day per batch of the practical examination.

(B) Each candidate must produce a certificate from the Head of the Department in her/his college, stating that he/she has completed in a satisfactory manner the practical course on lines laid down from time to time by Academic Council on the recommendations of Board of Studies and that the journal has been properly maintained. Every candidate must have recorded his/her observations in the laboratory journal and have written a report on each exercise performed. Every journal is to be checked and signed periodically by a member of teaching staff and certified by the Head of the Department at the end of the semister. Candidates must produce their journals at the time of practical examination.

Question Paper Pattern (25 Marks) **Semisterwise Practical Exam**		
Semister	**Nature / Type of Question**	**Marks**
I	Group A : One experiment Group B : One experiment Certified Journal & Oral	**10** **10** **05**
	Total Marks (For Semister I)	**25**
II	Group A : One experiment Group B : One experiment Certified Journal & Oral	**10** **10** **05**
	Total Marks (For Semister II)	**25**
Total Marks		**50**