

NOTIFICATION

25 FEB 2015

No. UOS/Acad/210

Dated: 24.02.2015

On the recommendations of the Academic Council dated 10.07.2014, the Vice-Chancellor has been pleased to approve the revised curricula provisionally for following programs subject to final approval by the Syndicate from the session mentioned against each:-

- (i) Revised curriculum of BS Physics for implementation w.e.f 2013-17 session (Annex-'A').
- (ii) Revised curriculum of M.Sc Physics for implementation w.e.f 2013-15 session (Annex-'B').

ACES
25/2/15

Distribution:

- Chairman, Department of Physics
- Directors, Sub-Campuses (Mianwali & Bhakkar)
- Controller of Examinations
- Principals of Affiliated Colleges concerned
- Web-Developer (for uploading on university web-site)
- Chief Executives of Sub-Campuses established under Public Private Partnership Policy
- Notification file

C.C:

- Dean, Faculty of Science
- Secretary to the Vice-Chancellor
- P.A to Registrar

M Kamran
(MUDASSAR KAMRAN)

Additional Registrar

for Registrar

Office of the Controller of Exa

No. C.E(R) (D) 1177

Date 25/2/15
To return marked

GRV
25/2/15

CURRICULUM

BS IN PHYSICS
(Four Years Program)
SESSION (2013-2017)



DEPARTMENT OF PHYSICS
UNIVERSITY OF SARGODHA
SARGODHA, PAKISTAN

**ACADEMIC PROGRAMME BEING OFFERED
AT THE DEPARTMENT OF PHYSICS**

BS PHYSICS PROGRAMME:

Program Duration: 4 Years (8 Semesters)

Teaching System: Semester System

Start of Session: Fall (September) 2013

Course Code	Course Title	Credit Hours
Semester-I		
PHYS-101	Mechanics-I	3(3-0)
PHYS-102	Waves and Oscillations	3(3-0)
MATH-103	Applications of Differentials	3(3-0)
ENG-104	English-I	3(3-0)
PKST-105	Pakistan Studies	2(2-0)
Total		14
Semester-II		
PHYS-106	Mechanics-II	3(3-0)
PHYS-107	Electricity and Magnetism-I	3(3-0)
MATH-108	Techniques of Integration	3(3-0)
ENG-109	English-II	3(3-0)
ISL-110	Islamic Studies	2(2-0)
Total		14
Semester-III		
PHYS-201	Electricity and Magnetism-II	3(3-0)
PHYS-202	Fundamentals of Quantum Mechanics	3(3-0)
PHYS-203	Physics Lab-I	3(0-3)
MATH-204	Calculus	3(3-0)
MATH-205	Ordinary Differentials Equations	3(3-0)
ENG-206	English-III	3(3-0)
Total		18
Semester-IV		
PHYS-207	Basics of Electronics and Nuclear Physics	3(3-0)
PHYS-208	Theory of Thermodynamics	3(3-0)
PHYS-209	Physics Lab-II	3(0-3)
MATH-210	Vectors and Tensors Analysis	3(3-0)
MATH-211	Linear Algebra	3(3-0)
STAT-212	Theory of Error Analysis	3(3-0)
Total		18

Course Code	Course/Title	Credit Hours
Semester-V		
PHYS-301	Methods of Mathematical Physics-I	3(3-0)
PHYS-302	Classical Mechanics-I	3(3-0)
PHYS-303	Electrodynamics-I	3(3-0)
PHYS-304	Electronics	3(3-0)
PHYS-305	Electronics Lab	3(3-0)
Total		15
Semester-VI		
PHYS-306	Methods of Mathematical Physics-II	3(3-0)
PHYS-307	Classical Mechanics-II	3(3-0)
PHYS-308	Electrodynamics-II	3(3-0)
PHYS-309	Quantum Mechanics-I	3(3-0)
PHYS-310	Solid State Physics-I	3(3-0)
PHYS-311	Modern Physics Lab	3(0-3)
Total		18
Semester-VII		
PHYS-401	Statistical Mechanics	3(3-0)
PHYS-402	Atomic and Molecular Physics	3(3-0)
PHYS-403	Plasma Physics	3(3-0)
PHYS-404	Quantum Mechanics-II	3(3-0)
PHYS-405	Solid State Physics-II	3(3-0)
	Optional Course*/Thesis**	3(3-0)
Total		18
Semester-VIII		
PHYS-406	Computational Physics	3(3-0)
PHYS-407	Laser Physics	3(3-0)
PHYS-408	Relativity and Cosmology	3(3-0)
PHYS-409	Nuclear and Elementary Particle Physics	3(3-0)
	Optional Course*/Project [†]	3(3-0)
Total		15
Total Credit Hours: 130		

Optional Courses*		
PHYS-410	Advanced Electronics	3(3-0)
PHYS-411	Physical and Geometrical Optics	3(3-0)
PHYS-412	Physics of Nanotechnologies	3(3-0)
PHYS-413	Methods of Experimental Physics	3(3-0)
PHYS-414	Advanced Electronics LAB [☆]	3(0-3)
PHYS-415	Introduction to Quantum Computing	3(3-0)
PHYS-416	Particle Physics	3(3-0)
PHYS BSPr	Project [†]	3

- (*) Students may take any one of the optional courses offered at the department, in each semester.
- (**) Two optional courses (Optional course-I in semester VII and Optional course-II in semester VIII) will be offered from the list of optional courses depending upon the recourses of the department.
- (1) A project of 03 credit hours can also be opted in the 8th semester.
- (2) Advanced Electronics LAB will be compulsory requirement for the students taking Advanced Electronics as an Optional Course.

COURSE OUTLINE

Semester-I

PHYS-101 Mechanics-I Cr.H-3(3-0)

Units and Dimensions, Review of vectors, Motion in one/two/three dimensions, Newtonian mechanics, Friction, Drag force, Work and kinetic/potential energy, Linear momentum, Conservation of momentum/energy, Power, System of particles, Collisions in one/two dimensions, Systems with variable mass.

Textbooks:

1. Halliday, Resnick and Krane, Physics, John Wiley & Sons Inc, 5th ed. 2007.
2. Halliday, Resnick and Walker, Fundamental of Physics, Extended. John Wiley & Sons Inc, 8th ed. 2008.

Recommended Books:

1. Young, Freedman and Ford, Sears and Zemansky's University Physics, Pearson Education Inc, 11th 2006
2. Giancoli, Physics for Scientist and Engineers with Modern Physics, 2nd ed. Prentice Hall Inc. 1988.

PHYS-102 Waves and Oscillations Cr.H-3(3-0)

Prerequisite: Intermediate level Knowledge of optics and waves mechanics.

S.H.M & its applications, Energy consideration in SHM, SHM & uniform circular motion, combinations of Harmonic motion, Damped harmonic oscillator, Forced Oscillation, Driven harmonic oscillator, Resonance, Mechanical Waves, Traveling waves, wave speed , linear wave equation, Power & intensity in wave motion, Principle of superposition, standing waves, Interference of waves, Beats, Doppler effect & its applications, Supersonic and Shock waves, Nature of light , Measurement of speed of light by Roemer's and Fizeau's methods , Reflection, Refraction, Huygens's principle and its applications to reflection and refraction , Fermat's principle, Conditions for interference, Young's double slit experiment, Intensity distribution in double slit interference pattern, adding waves using phasor, interference from thin film, Introduction to diffraction pattern, Single slit diffraction pattern, Intensity in single slit diffraction pattern using phasor, diffraction at circular aperture, diffraction grating, x-ray Diffraction, Polarization by selective absorption, Reflection, Double Refraction, scattering & optical activity.

Recommended Books:

1. Physics Vol. I & II by Resnick, Halliday and Krane 5th Edition, John Wiley and Sons Inc, New York, 2002.
2. Fundamental of Physics by Halliday, Resnick and Walker, 8th extended Edition, John Wiley and Sons Inc, New York, 2008.
3. University Physics, 8th Edition by Sears, Zemansky and Young, Addison-Wesley, Reading (MA), USA, 2000.

4. Physics by Alonso and Finn: Addison-Wesley, Reading (M.A), USA, 1999.
5. Physics for scientist and engineers by Serway and Jewett, 6th Edition, Thomson Brooks/cole, 2004.

MATH-103 Applications of Differentials Cr.H-3(3-0)

Limits: Limit of a Function, Infinite Limits, The Squeeze Theorem, The Sum Law. Continuity: The Intermediate Value Theorem, Horizontal Asymptotes, Derivatives and Rates of Change, Derivatives as a Function, Derivatives of Polynomials and Exponential Functions, Power Rule, The Product and Quotient Rules, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation, Exponential Growth and Decay, Hyperbolic Functions. Applications of Differentiations: The Extreme Value Theorem, Fermat's Theorem, The Mean Value Theorem, Concavity Test, Indeterminate Forms and L'Hospital Rule, Curve Sketching, Optimization Problems.

Chapter No. 2, 3 and 4 of text book.

Note: All those topics that are already covered in Intermediate classes must not be repeated in this course.

Recommended Books:

1. Text Book: Calculus Early Transcendentals by James Stewart Brooks/Cole (5th and onwards editions).
2. Calculus: A New Horizon by Anton H., John Wiley, 6th ed. (1999).
3. Calculus by Thomas G.B., Finney A.R., Addison-Wesley, 10th ed. (2002).

ENG-104 English-I Cr.H-3(3-0)

Section	Topics	Source
I	Part 1(Semantics): Antonyms, Synonyms, Homonyms – one word substitution	Chapter 1 (Book 5)
I	Part 2 (Syntax): Traditional Grammar	Chapter 1 (Book 3)
	a) Parts of Speech: Major word classes	
	b) Further classifications (regular, countable; uncountable; singular; plural),	Chapter 2 (Book 1)
	c) Pronouns	
	d) Verbs	
	e) Adjectives	Chapter 4 (Book 2)
	f) Adverbs	
	g) Minor word classes: Preposition,	
	h) Conjunctions	
	i) Interjections, Auxiliary verbs an Determiners	
	j) Kinds of verbs: finite and non finite	

II	<p>Part 3 (Syntax) Modern Grammar –</p> <ul style="list-style-type: none"> k) Sentence Structure: l) Types of sentences based on function m) Mood n) Transformation, Inversion of sentences o) Analysis of Complex sentences p) Subject, Predicate, Complements, direct & indirect objects q) Phrases r) Syntactical rules (subject & verb agreement) s) Synthesis of sentences <ul style="list-style-type: none"> • Clauses – types and functions 	<p>Chapter 24, 25 (Book 2)</p> <p>Chapter 26 (Book 3)</p> <p>Chapter 7 (Book 5)</p>
II	<p>Part 4 (syntax): Tense and voice</p> <ul style="list-style-type: none"> a) Structure of tenses b) Function, Conversion into negative and interrogative. c) Active and Passive voice and usage d) Conditionals <p>Punctuation</p>	<p>Chapter 17 & 18 (Book 3)</p> <p>Chapter 30 (Book 3)</p>
III	<p>Part 5 (Narration):</p> <ul style="list-style-type: none"> e) Direct and Indirect speech f) Rules of conversion 	<p>Chapter 31 (Book 3)</p>
III	<p>Part 6 (Structural words):</p> <ul style="list-style-type: none"> -Articles and Practical usage 	<p>Chapter 83 (Book 1)</p>
III	<p>Part 7 (Discourse): Composition and comprehension</p> <ul style="list-style-type: none"> • Precis Writing • Essay Writing 	<p>Chapter 32 (Book 5)</p> <p>Chapter 38 (Book 2)</p>

Recommended Text:

- 1) Eastwood, J (2005) *Oxford Practice Grammar*. UK: Oxford.
- 2) Martin & Wren (2007) *High School, English Grammar & Composition*. New Delhi: S Chand & Company Limited.
- 3) Martinet & Thomson (1992) *A practical English Grammar*. UK: Oxford.
- 4) Swan, M (2005) *Practical English Usage*. UK: Oxford University Press.
- 5) Shah, Sayyid (2006) *Exploring the world of English*. Lahore: Ilmi Kitab Khana.

Two Nation Theory and Ideology of Pakistan: Historical background of creation of Pakistan, Two Nation Theory in its historical context definition and interpretations, Quaid-i-Azam and his political ideas. Political Dynamics of Pakistan: Constitutional development in Pakistan. (1947-78), Salient features of constitution of Pakistan 1973, Institutions of Pakistan: political parties, bureaucracy, army, judiciary and media, Problems, of Pakistan as a federal State. Socio-Economic Issues of Pakistan: Economical problem, Social and demographic Issues. Diplomatic Dynamics of Pakistan: Determination and objectives of Pakistan's foreign policy, Pakistan's

relations with its neighboring countries, Pakistan and the Muslim World (A comprehensive review of foreign policy of Pakistan).

Recommended Books:

1. Pakistan's Political, Economic, and Diplomatic Dynamics, by Javed Ahmad Sheikh Lahore: Kitabistn Paper Products.
2. Other relevant readings for the individual subjects shall be recommended by the teacher during the course.

Semester-II

PHYS-106 Mechanics - II Cr.H:3(3-0)

Perquisite: Mechanics --I.

Rotational dynamics, Moment of inertia, Principles of parallel and perpendicular axis theorem, Determination of moment of inertia of various shapes, Rotational dynamics of rigid bodies and its effect on the application of torque, Angular momentum and its conservation, Effect of torque on the angular momentum, Measurement of gravitational constant, Free fall acceleration and Gravitational force, Gravitational effect of spherical mass distribution, The motion of planets and Kepler laws in detail, Motion of satellite and its energy consideration in planetary and satellite motion, Bulk properties of matter, Fluid statistics, Fluid dynamics, Inertial and non-inertial frames of references, Theory of relativity, Postulates of special theory of relativity, Galilean transformation equations, Lorentz transformation and its consequences, Transformation of velocities, Variation of mass with velocity, mass energy relation and its importance, Relativistic energy and momentum, General theory of relativity.

Recommended Books:

1. Physics by D. Halliday, R. Resnick and K. S. Krane, John Wiley & Sons Inc., 5th Ed. (2007).
2. Fundamental of Physics by D. Halliday, R. Resnick and J. Walker, Extended. John Wiley & Sons Inc., (2008).
3. University Physics by Young, Freedman and Ford, Seers and Zemansky's Pearson Education Inc., (2008).
4. Physics for Scientist and Engineers by Giancoli, Prentice Hall Inc., 5th Ed. (2007).
5. Physics for scientist and engineers by Serway and Jewett, 6th Edition, Thomson Brooks/cole, 2004.

PHYS-107 Electricity and Magnetism-I Cr.H:3(3-0)

Electric charge (properties/quantization/conservation), Coulombs law in free space, Electric field due to discrete/continuous charges distributions, Electric dipole, Electric flux, Gauss's law and its applications, Electric potential due to discrete/continuous charges distributions, Work and Electric potential energy, Capacitors and capacitance, Capacitance for various geometries, Capacitance with Dielectrics, Electric Current, current density, Resistance and resistivity, Microscopic and macroscopic forms of Ohm's Law, Energy transfer in electric circuit, Power in electric circuits, Calculating current in a single loop and multiple loop by using Kirchoff laws, Circuit analysis, Growth and decay of current in RC-circuits and its analytical treatment.

Recommended Books:

1. Physics by D. Halliday, R. Resnick and K. S. Krane, John Wiley & Sons Inc., 5th Ed. (2003).
2. Fundamental of Physics by D. Halliday, R. Resnick and J. Walker, Extended. John Wiley & Sons Inc., (2008).
3. University Physics by Young, Freedman and Ford, Seers and Zemansky's Pearson Education Inc., (2008).
4. Physics for Scientist and Engineers by Giancoli, Prentice Hall Inc., 4th Ed. (2007).
5. Field and Wave Electromagnetic by David K. Cheng, Addison-Wesley, (1989).

Integrals: Area between curves, Volumes, Work, Average Value of a Function. Techniques of Integration: Integration by parts, Trigonometric Integrals, Trigonometric Substitution, Integration of Rational Functions by Partial Fraction, Approximate Integration, Improper Integration. Further Applications of Integration: Arc Length, Area of a Surface of Revolution, Applications, Probability.

Chapter No. 6, 7 and 8 of text book.

Note: All those topics that are already covered in Intermediate classes must not be repeated in this course.

Recommended Books:

1. Text Book: Calculus: Early Transcendentals by James Stewart Brooks/Cole (5th and onwards editions)
2. Calculus: A New Horizon by Anton H., John Wiley, 6th ed. (1999).
3. Calculus by Thomas G.B., Finney A.R., Addison-Wesley, 10th ed. (2002).

Topic	Source	Section
Writing as a process: Strategies for generating ideas, Strategies for planning, Strategies for drafting, Strategies for developing, Strategies for revising and editing	Ch 1, Book 1	Section A
Paragraph Skills: Introducing a paragraph: Organization of a paragraph, Topic sentences, Controlling idea, Supporting sentences and details, Connecting sentences Concluding sentences, Selecting a title	Ch 3, Book 1	Section A
Revising a paragraph: First stage draft (for description) First stage draft (for narration) First stage draft (for exposition) Second stage drafts: all patterns of development	Ch 4, Book 1	Section A
Editing: Editing review , Editing problems for all patterns of development Proofreading: How to proofread and prepare your final manuscript	Ch 4, Book 1	Section A
Essays: Essay form, Introductory paragraphs, Thesis sentence, Developing body paragraphs, Concluding paragraphs	Ch 12, Book 1	Section A
Personal Letters: Letters of : Invitation, Regrets, Routines	Part 3, Book3 Part 5, Book 3	Section B
Official Writing: Writing an application, CV and Memo, Joining reports, Leaving reports, Notifications, Meeting notices Minutes of meeting	Part 3, Book3 Part 5, Book 3	Section B
Business Letters: Sales/persuasive letters, Bad news messages, Good news message	Part 3, Book3 Part 5, Book 3	Section B

Sentence Skills	Unit 11 A, Book4 Unit 12 A, Book4	Section B
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Recommended Text:

1. Brannan, B. ,(2003), *A Writer's Workshop: Crafting paragraph, building essays*, New York, McGraw Hill
2. Wong ,(2002), *Paragraph Essentials: A writing guide*, Boston, Houghton Mifflin
3. Bovee, C.L. et.al ,(2002), *Business Communication Today*, India, Pearson Education
4. Maimon, E. P. & Peritz, J. H ,(2003), *A Writer's Resource: A handbook for writing and research*, NY, McGraw Hill
5. Kennedy, X. J., Kennedy, M. D. & Holladay, S. A ,(1999), *The Bedford Guide for College Writer*, Bedford, St. Martin's
6. Burton, S. H. ,(2000), *Mastering Practical Writing*, NBF

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نصاب برائے اسلامیات لازمی کلاس BS 4 Years

باب اول: مطالعہ قرآن وحدیث

باب دوم: مطالعہ سیرت

باب سوم: مطالعہ تہذیب وقہم

باب اول: مطالعہ قرآن وحدیث (Topical Study of Quran & Hadith)

موضوعات

انزجید (ولکل کاشی وکل مطالعہ فکر وتدبر)

آیات

۱. اللہ مافی السموات وما فی الارض وان تدوا مافی انفسکم او تخفوه بحاسبکم به اللہ لیغفر لمن یشاء ویعذب من یشاء واللہ علی کل شیء قدير. (البقرة: ۲۸۳)

۲. الم تر ان اللہ سخر لکم مافی السموات وما فی الارض راسخ علیکم نعمه ظاهرة و باطنة ومن الناس من یجادل فی اللہ بغير علم ولا ہدی ولا کتاب متبر. (لقمان: ۲۰)

۳. ربنا لاتواخذنا ان نسینا و اخطانا ربنا ولا تحمل علينا اھمرا کما حملتہ علی الذین من قبلنا ربنا ولا تحملنا ما لا لقاة لنا ربنا واعف عنا و اغفر لنا وارحمنا انت مولانا فانصرنا علی القوم الکافرین. (البقرة: ۲۸۶)

۴. سترہم ابانتا فی الافاق و فی انفسہم حتی یتبین لہم انه الحق اولم یکف برہک انه علی کل شیء شہید. (تم السجدة: ۴۱)

ان فی خلق السموات و الارض و اختلاف اللیل و النهار لایت الا لایات (آل عمران: ۱۹۰)

۵. الذین ینکرون اللہ فیما رزقوا و یقولون انہم ربنا و یستکبرون فی خلق السموات و الارض ربنا ما خلقت هذا باطلا لیسجانک لقا عذاب النار. (آل عمران: ۱۹۲)

احادیث

۱. عن عمر بن الخطاب قال قال رسول اللہ ﷺ: من سئل عن الايمان ان تومن بالله و ملائکته و کتبه و سلہ و الیوم الآخر تومن بالقدر خیرہ و شرہ (متفق علیہ)

۲. رسالت (الہامی کتب و ملائکہ پر ایمان، آداب نبوی، اطاعت رسول اور ختم نبوت)

آیات

۱. امن الرسول بما انزل الیہ من ربه و المؤمنون کل امن بالله و ملائکته و رسالہ لا یفرق بین احد من رسالہ و قالوا سمعنا و اطعنا غفرانک ربنا و الیک المصیر (البقرة: ۲۳۵)

۲. یا ایہا الذین امنوا لا تقدموا بین یدی اللہ و رسوله و اتقوا اللہ ان اللہ سميع علیم. (الحجرات: ۱)

وَأَخْبَرَنَا أَبُو بَكْرِ بْنُ أَبِي شَيْبَةَ عَنْ يَحْيَى بْنِ أَبِي عَدِيٍّ عَنْ يَحْيَى بْنِ أَبِي عَدِيٍّ عَنْ يَحْيَى بْنِ أَبِي عَدِيٍّ عَنْ يَحْيَى بْنِ أَبِي عَدِيٍّ (الصف: ١٢٣)

أَخْبَرَنَا

١ عن ابن عمر قال: قال رسول الله ﷺ: بنى الإسلام على خمس شهادة أن لا إله إلا الله وأن محمداً عبده ورسوله وإقام الصلاة وإيتاء الزكاة والحج وصوم رمضان (متفق عليه)

٢ عن شيراز بن مبيد قال: قال رسول الله ﷺ: مروا الضبي الصلوة إذا باع سبع سنين وإذا بلغ عشر سنين فاضربوه عليها من أبر (دار جامع ترمذى)

٣ عن أبي هريرة قال: قال رسول الله ﷺ: أتاه الله مالا فلم يود ركوة مثل له ماله يوم القيامة شجاعاً أقرع له زبيبتان يطرفه يوم القيامة ثم يأخذ بلهزمتيه (يعنى شدقيه) ثم يقول أنا مالك وأنا كترك لم تلوأ لا يحسن الذين يبخلون بما آتاهم الله من فضله هو خير لهم بل هو شر لهم يسطون ما يبخلوا به يوم القيامة..... الخ (بخارى)

٤ عن علي قال: قال رسول الله ﷺ: من ملك زاد راحلته تبلغه إلى بيت الله ولم يحج فلا عليه أن يموت يهودياً أو نصرانياً وذلك أن الأضراسك وبغالى يقول والله على الناس حج البيت من استطاع إليه سبيلاً (- مع ترمذى)

من صفات المؤمنين

آيات

١ وعاد الرحمن الذين يمشون على الأرض هوناً وإذا خاطبهم الجاهلون قالوا سلماً (الفرقان: ١)

٢ والذين يبيتون لربهم سجداً وقياماً (الفرقان: ٢)

٣ والذين يقولون ربنا اصرف عنا عذاب جهنم إن عذابها كان غراماً (الفرقان: ٣)

٤ وهم أسماءت مستقراً أو مقاماً (الفرقان: ٤)

٥ والذين إذا انفروا لم يسرفوا ولم ينتروا وكان بين ذلك قواماً (الفرقان: ٥)

٦ والذين لا يدعون مع الله الهاً آخر ولا يقتلون النفس التي حرم الله إلا بالحق ولا يزنون ومن يفعل ذلك يلق الأمان (الفرقان: ٦)

٧ ويضعف له العذاب يوم القيمة ويخلد فيه مهاناً (الفرقان: ٧)

٨ إلا من تاب وعمل صالحاً فأولئك يبدل الله سيئاتهم حسنتاً وكان الله غفوراً رحيماً (الفرقان: ٨)

٩ ومن تاب وعمل صالحاً فإنه يتوب إلى الله متابياً (الفرقان: ٩)

١٠ والذين لا يشهدون الزور وإذا مروا باللغو مروا كراماً (الفرقان: ١٠)

١١ والذين إذا ذكروا بايت ربهم لم يخروا عليها أصماً وعمياناً (الفرقان: ١١)

١٢ والذين يقولون ربنا هب لنا من أزواجنا ذرياتنا قرأه أعين واجعلنا للمتقين إماماً (الفرقان: ١٢)

١٣ أولئك يجزون الغرفة بما صبروا ويلقون فيها تحيةً وسلاماً (الفرقان: ١٣)

١٤ خلدين فيها حسنت مستقراً أو مقاماً (الفرقان: ١٤)

١٥ قل ما يعجزاكم ربى لو أذعازكم فقد كذبتم فسوف يكون لزاماً (الفرقان: ١٥)

١٦ والذين هم لفرجهم حافظون (المؤمنون: ٣)

١٧ إلا على أزواجهم أو ما ملكت أيمانهم فانهم غير ملومين (المؤمنون: ١٧)

١. والذين هم على صلواتهم يحافظون. (المؤمنون: ٦)

٢. اولئك هم الوارثون. (المؤمنون: ٤)

٣. الذين يربون القردوس. (المؤمنون: ٨)

٤. هم فيها خالدون. (المؤمنون: ٩)

احاديث

١. عن النبي قال: قال رسول الله ﷺ والذي نفسي بيده لا يؤمن عبدا حتى يحب لا يحبه ما يحب لنفسه (متفق عليه)

٢. عن النعمان بن بشير قال: قال رسول الله ﷺ ترى المؤمنين في تراحمهم وتوادهم وتعاطفهم كمثل الجسد اذا اشتكى عضو بدأ به حتى له سائر الجسد بالسهر والحمى (متفق عليه)

١٠ آداب معاشرت

١. وان طافتم من المؤمنين اقتلوا فاصلحوا بينهما فان بغت احدهما على الاخرى فقاتلوا التي تبغي حتى تفيء الى امر الله فان كانت فاضلة وابنتها بالعدل والسطوا ان الله يحب المقسطين. (الحجرات: ٩)

٢. انما المؤمنون اخوة فاصلحوا بين اخوتكم واتقوا الله لعلكم ترحمون. (الحجرات: ١٠)

٣. يا ايها الذين امنوا لا يستخرفكم من قوم عسى ان يكونوا خيرا منهم ولا نساء من نساء عسى ان يكن خيرا منهن ولا تلمزوا انفسكم ولا تتنازروا بالالقباب بس الاثم القسوق بعد الايمان ومن لم يت فارلنك نم الظالمون. (الحجرات: ١١)

٤. يا ايها الذين امنوا اجتنبوا كثير من الظن ان بعض الظن اثم ولا تجسسوا ولا يغتب بعضكم بعضا. يحب احدكم ان ياكل لحم اخيه ميتا كحمتوه واتقوا الله ان الله تراب رحيم. (الحجرات: ١٢)

٥. يا ايها الذين اتاخلفناكم من ذكر وانثى وجعلناكم شعوبا وقبائل ليعرفوا ان كرمكم عند الله اتقاكم ان الله عليم خبير. (الحجرات: ١٣)

احاديث

١. عن ابي هريرة ان رسول الله ﷺ قال: ان المفلس من امي من ياتي يوم القيامة بصلاة و صيام و زكوة، وياتي قد شتم هذا، و قد ذل هذا، و اكل مال هذا، و سفك دم هذا، و ضرب هذا، فيعطى هذا من حسنة، وهذا من حسنة، وهذا من حسنة، فان شئت حسنة ليل ان يقضى ما عليه اجته، من خطاياهم فطرح عليه ثم طرح في النار

٢. زكوت واقامت دين

١. ومن اظلم ممن افترى على الله الكذب وهو يدعى الى الاسلام والله لا يهدي القوم الظالمين. (الصف: ٢١)

٢. يريدون ليظفونوا نور الله بالفواهيم، والله متم نوره ولو كره الكافرون. (الصف: ٢٢)

٣. هو الذي ارسل رسوله بالهدى ودين الحق ليظهره على الدين كله ولو كره المشركون. (الصف: ٢٣)

احاديث

١. عن ابي سعيد بن الخديري عن رسول الله ﷺ قال من راي منكم مذكرا فليغيره بيده فان لم يستطع فليسانه فان لم يستطع فليقلبه و ذلك اصعب الايمان (مسلم)

٢. عن عبد الله بن عمر قال: قال رسول الله ﷺ الا كلكم راع و كلك مسؤل عن رعيته فالامام الذي على الناس راع و هو مسؤل عن رعيته و الرجل راع على اهله و رعيته و هو مسؤل عن رعيته و المرأة راعية على بيت زوجها و ولده و هي مسؤلة عنهم و عبد الرجل راع على

٢. يا أيها الذين آمنوا لا ترفعوا أصواتكم فوق صوت النبي ولا تجهروا له بالقول كجهر بعضكم لبعض أن تحبط أعمالكم وأنتم لا تشعرون
(الحجرات: ٢)

٣. إن الذين يعصون أوصيهم عند رسول الله أولئك الذين امتحن الله قلوبهم للتقوى لهم مغفرة وأجر عظيم (الحجرات: ٣)

٤. ولأنهم صبروا حتى تخرج إليهم لكان خيرا لهم والله غفور رحيم (الحجرات: ٤)

٥. إن الذين يتنادونك من وراء الحجرات أكثرهم لا يعقلون (الحجرات: ٥)

٦. يا أيها الذين آمنوا إن جاءكم فاسق بنبأ فتبينوا أن تصيروا قوماً يجهالة فتسبحوا على ما فعلتم نادمين (الحجرات: ٦)

٧. واعلموا أن فيكم رسول الله لو يطيعكم في كثير من الأمر لعنتم ولكن الله حبب إليكم الإيمان وزينه في قلوبكم وكره إليكم الكفر والفسوق والعصيان أولئك هم الرافضون (الحجرات: ٧)

٨. فضلا من الله ونعمة والله عليم حكيم (الحجرات: ٨)

٩. النبي أولى بالمؤمنين من أنفسهم وأزواجه أمهاتهم وأولو الأرحام بعضهم أولى ببعض في كتاب الله من المؤمنين المهاجرين إلا أن تعبدوا آل أبي لهب كما معروفاء، كان ذلك في الكتاب مسطورا (الأحزاب: ٦)

١٠. إن الله وملائكته يصلون على النبي يا أيها الذين آمنوا صلوا عليه وسلموا تسليما (الأحزاب: ٥٦)

١١. إن الذين يؤذون الله ورسوله لعنهم الله في الدنيا والآخرة وأعد لهم بدايا مهينا (الأحزاب: ٥٤)

١٢. لقد كان لكم في رسول الله أسوة حسنة لمن كان يرجو الله واليوم الآخر وذكر الله كثيرا (الأحزاب: ٢١)

١٣. ما كان محمد أبا أحد من رجالكم ولكن رسول الله وخاتم النبيين وإن الله بكل شيء عليم (الأحزاب: ٤٠)

أحاديث

عن أنس بن عبيد المطلب قال: قال رسول الله ﷺ ذاق طعم الإيمان من رضى بالله وباد بالاسلام ديناً وبمحمد رسولا

أخرت

آيات

١. يا أيها الذين آمنوا اتقوا الله ولنظرنفس ماقدمت لغد واتقوا الله إن الله خبير بما تعملون (الحشر: ١٨)

٢. ولا تكونوا كالذين سوا الله فانهم اتفهم أولئك هم الفاسقون (الحشر: ١٩)

حديث

عن ابن مسعود عن النبي ﷺ لا تزول قدما ابن آدم حتى يستل عن خمسه عن عمره فيما افناه وعن شبابه فيما ابلاح وعن ماله من ابن اكتسه و فيما انفقته وما ذا عمل فيه علم (جامع ترمذي)

١٢. عبارات (نماز، زكوة، روزه، حج، جهاد)

١. ق. الفلاح المؤمنون الذين هم في صلاتهم خاشعون (المؤمنون: ١) ٢. والذين هم عن اللغو معرضون (المؤمنون: ٢)

٣. والذين هم للزكوة فاعلون (المؤمنون: ٣)

٤. يا أيها الذين آمنوا هل ادلكم على تجارة تنجيكم من عذاب اليم (الصف: ١٠)

٥. يا أيها الذين آمنوا بالله ورسوله وتجاهدون في سبيل الله بأموالكم وانفسكم ذلكم خير لكم إن كنتم تعلمون (الصف: ١١)

٦. يعزلكم ذنوبكم ويدخلكم جنات تجري من تحتها الأنهار مساكن تفيض في جنات عدن ذلك الفوز العظيم (الصف: ١٢)

قال سده وهو رسول عنه الا فكلكم راع وكلکم مسؤول عن رعيته (متفق عليه)
 قال رسول الله ﷺ: يجاء الرجل يوم القيامة فيلقى في النار فتندلق اقسابه في النار فيطحن فيها كطحن الحمار برحاه فيجتمع اهل
 النار عليه فيقولون: ابي فلان ماشانك، السن كت نامرنا بالمعروف وتنهاننا عن المنكر؟ قال كنت امرکم ولا اتنه ونناکم عن المنکر
 راتيه

الحديث
 ابن عبد الله قال: قال رسول الله ﷺ طلب كسب الجلال فريضة بعد الفريضة (بشيء) شعب الايمان
 ابن ابي عمير قال: قال رسول الله ﷺ الناجر الصدوق الامين مع النبيين والصديقين والشهداء، (جامع ترمذي)

باب دوم: مطالعہ عبرت (Seerah Study)

۱. مطالعہ عبرت کی اہمیت
۲. اکیس افسانہ اور تہذیب کی تاریخ
۳. شمالی معاشرت اور اسوہ حسنہ
۴. تہذیب و اخلاق اور برائیاں
۵. تہذیب و اخلاق اور معاشرہ و حکمت
۶. مطالعہ اور تاریخ

باب سوم: مطالعہ تہذیب و تمدن (Study of Culture)

۱. تہذیب کا مفہوم، اسلامی تہذیب کی خصوصیات
۲. زیادتی انسانی حقوق
۳. تہذیب انسانی کے ارتقاء میں مسلمانوں کا کردار
۴. اسلام کا تصور و علم
۵. طبیعی علوم، حیاتیاتی علوم اور معاشرتی علوم میں مسلمانوں کا کردار
۶. دکانہ بین المذاہب

Semester-III

PHY-S-201 Electricity and Magnetism-II Gr: III (3-0)

Magnetic field, Magnetic forces on a single point charge/current carrying conductor, Torque on a current carrying loop and magnetic dipole, Biot & Savart Law and its analytical treatment and application, Ampers law and its applications, Electromagnetic induction and its laws, Inductance, Inductance for various configurations, LR circuits, Growth and decay of current in RL circuits, Electromagnetic Oscillation (Qualitative and Quantative analysis using differential equations), Forced electromagnetic oscillations and resonance, Alternating current circuits, Single loop RLC circuits (series and parallel), Power in AC circuits and phase angles, Maxwell's equations (integral/differential forms), Electromagnetic waves, Poynting vector. Magnetic properties of materials.

Recommended Books:

1. Physics by D. Halliday, R. Resnick and K. S. Krane, John Wiley & Sons Inc., 5th Ed. (2003).
2. Fundamental of Physics by D. Halliday, R. Resnick and J. Walker, Extended. John Wiley & Sons Inc., (2008).
3. University Physics by Young, Freedman and Ford, Seers and Zemansky's Pearson Education Inc., (2008).
4. Physics for Scientist and Engineers by Giancoli, Prentice Hall Inc., 4th Ed. (2007).
5. Field and Wave Electromagnetic by David K. Cheng, Addison-Wesley, (1989).

PHYS-202**Fundamentals of Quantum Mechanics****Cr.H-3(3-0)**

Particle-like Properties of Electromagnetic Radiations: Black Body Radiation, Planck's Radiation Law and Quantum of Energy, Derivation of Stefan's Law and Wien's Displacement Law from Planck's Radiation Law, Quantization of Energy, Light Quantization and Photoelectric Effect. The Compton Effect. Wave-like Properties of Particles: Wave Nature of Matter and De-Broglie Hypothesis and its Experimental Verification, Wave Packet and its Localizations in Space and Time, Heisenberg Uncertainty Principle and its Applications. Bohr Model of the Atom: Hydrogen Spectrum, Bohr Theory of Atomic Structure, Bohr Theory of the Hydrogen Atom, Bohr Correspondence Principle, Experimental Evidence for Quantization and Determination of Critical Potential (Frank-Hertz Experiment), Deficiencies of the Bohr Model Characteristics of Vector Atomic Model (Space Quantization, Angular Momenta and Magnetic Momenta), Orbital Angular Momentum. Quantum Mechanics: Quantum Mechanics and its Postulates, Quantum Operators and their Properties, Eigen Value and Eigen Functions, Schrödinger Wave Equation (Time Dependent and Time Independent), Application of Time Independent Schrödinger Wave Equation, Probability Density using the Wave Function of the State,

Recommended Books:

1. Physics by D. Halliday, R. Resnick and K. S. Krane, John Wiley & Sons Inc., 5th Ed. (2003).
2. Fundamental of Physics by D. Halliday, R. Resnick and J. Walker, Extended. John Wiley & Sons Inc., (2008).
3. University Physics by Young, Freedman and Ford, Seers and Zemansky's Pearson Education Inc., (2008).
4. Physics by M. Alonso and E. J. Finn: Addison-Wesley, USA, (1999).
5. Concepts of Modern Physics by Arthur Beiser, 6th Edition, McGraw Hill, USA, (2003).

PHYS-203**Physics LAB-I****Cr.H-3(0-3)**

The following experiments are recommended for BS Physics LAB-I. Minimum number of experiments to be performed is six (06) from each lab. Teachers are requested to emphasize on graphical analysis, error calculation and on system of S.I. units in the beginning of session.

- Modulus of Rigidity by Static & Dynamic method (Maxwell's needle, Barton's Apparatus).
- Surface tension of water by capillary tube method.
- To determine the value of "g" by compound pendulum/Kater's Pendulum.
- To determine Horizontal/Vertical distance by Sextant.
- To study the laws of vibration of stretched string using sonometer.
- To determine the stopping potential by photo cell.
- Measurement of resistance using a Neon flash bulb and condenser
- Conversion of a galvanometer into Voltmeter & an Ammeter

MATH-204**Calculus****Cr.H-3(3-0)**

Parametric Equations: Curves defined by Parametric Equations, Calculus with Parametric Curves. Polar Coordinates: Introduction, Areas and Lengths in Polar Coordinates, Conic Sections, Conic Sections in Polar Coordinates. Infinite Sequence and Series: Sequences, Series, The Integral Test and Estimates of Sums, The

Comparison Tests, Alternating Series, Absolute Convergence and the Ratio and Root Test, Strategy for Testing Series, Power Series, Functions as Power Series, Taylor and Maclaurin Series.

Chapter No. 10 and 11 of text book.

Note: All those topics that are already covered in Intermediate classes must not be repeated in this course.

Recommended Books:

1. Text Book: Calculus: Early Transcendentals by James Stewart Brooks/Cole: (5th and onwards editions)
2. Calculus: A New Horizon by Anton H., John Wiley, 6th ed. (1999).
3. Calculus by Thomas G.B., Finney A.R., Addison-Wesley, 10th ed. (2002).

MATH-205: Ordinary Differential Equations Cr. H-3 (3-0)

Introduction, Mathematical Modeling of First and Second Order Differential Equations (ODEs), Solutions and Applications of First Order Differential Equations, Formation and Solutions of Higher Order Linear Differential Equations, Differential Equations with Variable Coefficients, Sturm-Liouville (S-L) System and Boundary-Value Problems, Series Solution and its Limitations, The Frobenius method.

Recommended Books:

1. Mathematical Methods for Physicists by George Arfken and Hans J. Weber, (6th and onwards editions) Acad Press.
2. Differential Equations with boundary-value problems, by D. G. Zill, M. R. Cullen, PWS Publishing Co. (1997).
3. Advanced Engineering Mathematics, Erwin Kreyszig, (2007).
4. Calculus Early Transcendentals by James Stewart Brooks/Cole (5th and onwards editions)

ENG-206: English-III Cr. H-3 (3-0)

Lecture	Topics	Book
1-5	<ul style="list-style-type: none"> • Language as a tool of communication • Communication is a process • Communication is transaction 	1, 2 & 3
6-8	<ul style="list-style-type: none"> • Levels of communication • Communication networks 	1, 2 & 3
9-11	<ul style="list-style-type: none"> • The process of human communication • The importance of communication skills to you 	1 & 2
12-15	<ul style="list-style-type: none"> • Basic communication principles • How does communication work • Communicating internally 	1, 2 & 3
16-18	<ul style="list-style-type: none"> • The role of communication • Why business communication • How business communication 	
19-21	<ul style="list-style-type: none"> • Classification of communication 	
22-27	<ul style="list-style-type: none"> • Definition of noise • Are you listening • Why do people hear 	
28-31	<ul style="list-style-type: none"> • Listening for information • Empathic listening 	
32-35	<ul style="list-style-type: none"> • Active listening • Active listening in business 	
36-40	<ul style="list-style-type: none"> • Implications of active listening • Passive listening in business 	

Exam

Term / semester ka ktna data enter ho gya ha.

41-45	Interpersonal relationship <ul style="list-style-type: none"> • Speaking skills • Presentation skills • Group discussion 	1,2
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Recommended Text (Latest Editions):

1. Saundar Hybels and Richard L. Weaver, "Communicating Effectively"
2. Raymond V. Lesikar and Marie E. Flatly, "Basic business communication"
3. Meenakshi Raman & Sangeeta Sharma, "Technical communication"
4. Pamela Angell, "Business communication Design"

Semester-IV

PHYS-207: Basics of Electronics and Nuclear Physics Cr.H-3(3-0)

Basic Electronics: Energy Bands in Solids, P-type and N-type Semiconductor Materials, P-N Junction (diode Structure), Characteristics and Application as Rectifiers, Transistor (basic Structure and Operation), Characteristics of Transistors, Load Line of a Transistor, Applications of a Transistor, Logic Gates and their basic Applications. Nuclear Structure and Radioactivity: Nuclear Structure and the Basic Properties of the Nucleus (Nuclear Size, Binding Energy, Angular Momentum of the Nucleus, Magnetic Moment and parity) Meson Theory of Nuclear Force. Radioactivity and Laws of Radioactive Decay, Conservation Laws in Radioactive Decays. Radioactive Isotopes and Carbon Dating. Nuclear Reactions: Types of Nuclear Reactions and their Q-values, The Compound Nucleus, Nuclear Fission and Fusion Applications of Nuclear Physics.

Recommended Books:

1. Physics by D. Halliday, R. Resnick and K. S. Krane, John Wiley & Sons Inc., 5th Ed. (2003).
2. Fundamental of Physics by D. Halliday, R. Resnick and J. Walker, Extended. John Wiley & Sons Inc., (2008).
3. University Physics by Young, Freedman and Ford, Seers and Zemansky's Pearson Education Inc., (2008).
4. Concepts of Modern Physics by Arthur Beiser, 6th Edition, McGraw Hill, USA, (2003).
5. Fundamentals of Quantum Chemistry by J. E. House, 2nd Edition, Elsevier Academic Press, USA, (2004).
6. Physics by M. Alonso and E. J. Finn: Addison-Wesley, USA, (1999).
7. Electronic Devices and Circuit Theory By Robert Boylestad and Louis Nashelsky, Prentice Hall, (2002).
8. Principles of Electric Circuits By T.L Floyd, Pearson Prentice Hall, (2007).
9. Electronic Devices by T.L. Floyd, Merril Publishing Company Columbus (1988).
10. Electronic Principles by A.P. Malvino; Tata McGraw Hill, New Delhi (1988).
11. Electronic Devices & Circuits by D.B. Bell, Reston Publishing Company Inc., Virginia (1980).
12. Electronic; Design Circuit & Systems by C.J. Savant Jr. M.S. Roden, G.L. Carpenter, The Bengamin/Cummings Publishing Co. California (1991).

PHYS-208: Theory of Thermodynamics Cr.H-3(3-0)

Kinetic Theory of Gases. Derivation of Fundamental Equation of Kinetic Theory of Gases, Maxwell Distribution of Molecular Speeds and Energies, Modification of Kinetic Theory for Real Gas, The Van der Waals Equation, Zeroth Law of Thermodynamics and Thermal Equilibrium, Definition and Formulation of the First Law of Thermodynamics, Calculation of Work Done, Consequences of the First Law of Thermodynamics, Definition & Measurement of Enthalpy, The Joule-Thomson Experiment, Carnot Cycle and Efficiency Measurements, Second Law of Thermodynamics and the Concept of Entropy, Entropy and

Entropy Measurements for Reversible and Irreversible Process. Combined First and Second law of Thermodynamics, Entropy Changes in the Ideal Gases, The Third Law of Thermodynamics and its Uses, Definition & Mathematical Expressions of Free Energy, Helmholtz Energy and Gibbs Energy, The Maxwell Relationship, Transfer of Heat, Distribution and Mean Values, Mean Free Path and Microscopic Calculations of Mean Free Path, Brownian Motion.

Recommended Books:

1. Fundamental of Classical and Statistical thermodynamics Bimalendu N. Roy Wiley & Sons Inc.,
2. Physics by D. Halliday, R. Resnick and K. S. Krane, John Wiley & Sons Inc., 5th Ed. (2003).
3. Fundamental of Physics by D. Halliday, R. Resnick and J. Walker, Extended. John Wiley & Sons Inc., (2008).
4. University Physics by Young, Freedman and Ford, Seers and Zemansky's Pearson Education Inc., (2008).

PHYS-209 Physics LAB-II Cr.H-3(0-3)

The following experiments are recommended for BS Physics LAB-I. Minimum number of experiments to be performed is six (06) from each lab. Teachers are requested to emphasize on graphical analysis, error calculation and on system of S.I. units in the beginning of session.

- To determine frequency of AC supply by CRO.
- Measurement of low resistance coil by a Carey Foster Bridge.
- Resonance frequency of an acceptor circuit
- Resonance frequency of a Rejecter Circuit.
- Determination of ionization potential of mercury.
- Characteristics of a semiconductor diode (Compare Si with Ge diode)
- Setting up of half & full wave rectifier & study of following factors
- To setup a single stage amplifier and measure its voltage gain.
- To set up and study various logic gates (AND, OR, NAND etc) using diode and to develop their truth tables.

MATH-210 Vectors and Tensors Analysis Cr.H-3(3-0)

Vector Analysis: Review of Vectors Algebra, Vector Differentiation and Gradient, Divergence and Gauss's Theorem, Vector Integration, Green's Theorem in Plane, Curl and Stoke's theorem. Curvilinear Coordinates: Orthogonal Coordinates in R^3 , Jacobian for Polar Coordinates, Differential Vector Operator in Curvilinear Coordinates, Circular Cylindrical Coordinates, Spherical Polar Coordinates. Tensor Analysis: Covariant and Contravariant Tensors, Symmetric and Antisymmetric Tensors, Direct Product and Contraction, Quotient Rule, Pseudotensors, Dual Tensors, Metric Tensors, Christoffel Symbols, Covariant Derivative, Geodesics, Parallel Transport, Tensor Derivative Operators.

Recommended Books:

1. Mathematical Methods for Physicists by George Arfken and Hans J. Weber, (6th and onwards editions) Acad Press.
2. Differential Equations with boundary-value problems, by D. G. Zill, M. R. Cullen, PWS Publishing Co. (1997).
3. Cartesian Tensors by F. I. Zafar and M. S. Zafar, Majeed Book Depot, Lahore.

MATH-211 Linear Algebra Cr.H-3(3-0)

Matrices: Addition, Multiplication, Transpose, Matrices and Systems of Linear Equations, Block Matrices. Polynomial in Matrices, Invertible Matrices, Complex Matrices, Elementary Matrices and Applications, Quadratic Forms, Similarity. Vector Space: Vector Spaces, Subspaces, Linear Combination, Linear Spans, Basis and Dimension, Linear Combination and Vector Space, Change of Basis. Orthogonality, Inner Product Spaces, Cauchy-Schwarz Inequality, Applications, Projections, Inner Products and Matrices, Normed Vector Spaces.

Recommended Books:

1. Schaum's Outline of Theory and Problem of Linear Algebra. Seymour Lipschutz. Mc-Graw Hill
2. Mathematical Methods for Physicists by George Arfken and Hans J. Weber, (6th and onwards editions) Acad Press.
3. Advanced Engineering Mathematics, Erwin Kreyszig, (2007).
4. Mathematical Physics by E. Butkov, Addison-Wesley London

SEME-212

Theory of Error Analysis

Cr.H-3(3:0)

Preliminary Description of Error Analysis, How to Report and Use Uncertainties, Discrepancy, Comparison of Measured and Accepted Values, Comparison of Two Measured Numbers, Checking Relationships with a Graph, Significant Figures and Fractional Uncertainties, Multiplying Two Measured Numbers, Propagation of Uncertainties, The Square-Root Rule, Independent Uncertainties in a Sum, Arbitrary Functions of One Variable, General Formula for Error Propagation, Statistical Analysis of Random Uncertainties, Random and Systematic Errors, The Mean and Standard Deviation, The Normal Distribution, Histograms and Distributions, Limiting Distributions, The Normal Distribution, The Standard Deviation as 68% Confidence Limit, Justification of the Mean as Best Estimate, Justification of Addition in Quadrature, Standard Deviation of the Mean, Acceptability of a Measured Answer, Rejection of Data, Chauvenet's Criterion, Weighted Averages, Least-Squares Fitting, Calculation of the Constants A and B and their uncertainty, Least-Squares Fits to Other Curves, Covariance and Correlation, Covariance in Error Propagation, Coefficient of Linear Correlation, Binomial Distribution and its Properties, Probabilities in Dice Throwing, The Poisson Distribution and its Properties, The Chi-Squared Test for a Distribution, Degrees of Freedom and Reduced Chi Squared, Probabilities for Chi Squared.

Recommended Books:

1. Data Reduction and Error Analysis for Physical Science by P. Bevington, McGraw Hill 3rd Edition 2003.
2. Errors of Observations by J.B.Toping, IOP, 1962.
3. An introduction to Error Analysis by John R.Taylor, University Science Books, California, 1982.
4. Measurements and their Uncertainties A practical guide to modern error analysis by I FAN G. HUGHES and THOMAS P. A. HASE, OXFORD UNIVERSITY PRESS

Semester-V

PHYS-301

Methods of Mathematical Physics-I

Cr.H-3(3:0)

Functions of Complex Variables: Calculus of Residues, Dispersion Relations, Method of Steepest Descents. Gamma Functions: Digamma and Polygamma Functions, Stirling's Series, Beta Functions, Incomplete Gamma Functions. Sturm-Liouville Theory (Orthogonal Functions): Hermite Operators, Completeness of Eigen Functions, Green's Functions-Eigen Function Expansion. Bessel Functions: Bessel Functions of first kind, Orthogonality, Neumann Functions, Hankel Functions, Modified Bessel Functions, Spherical Bessel Functions.

Recommended Books:

1. Mathematical Methods for Physicists by George Arfken and Hans J. Weber, (6th and onwards editions) Acad Press.
2. Advanced Engineering Mathematics, Erwin Kreyszig, (2007).
3. Mathematical Physics by E. Butkov, Addison-Wesley London
4. Complex Variables by M.R.Spiegel, Schaum's Outline Series, McGraw Hill, New York.
5. Introduction to Mathematical Physics by C.W. Wong, Oxford University, Press, New York (1991).
6. Foundations of Mathematical Physics by Hassani, Prentice Hall International Inc., Singapore (1991).
7. Mathematical Physics by Chattopadhyay Wiley Eastern Limited, New Delhi, (1990).
- 8.

Historical background of classical mechanics, Elementary scalar and vector operations, Kinematics of particle motion, Galilean transformations, The Newtonian formulation of mechanics, Integration of Newton's equation of motion, Conservation theorems, Rocket Motion, Kinematics of system of particles, Collision between particles, centre of mass co-ordinate system, Elastic collision in LAB and CM coordinate system, scattering by central force field, Rutherford's scattering formula, Simple Harmonic Oscillator, Harmonic Oscillation in two and three dimensions, Damped and forced Oscillator, Physical systems executing SHM, Non linear oscillations, Gravitation and Gravitational Potential, Poisson's Equations, Lines of force and Equi-potential surfaces.

Recommended Books:

1. Classical dynamics of particles and systems by S. T. Thornton, J. B. Marion, 5th. Edition Harcourt Brace and company (2012).
2. Classical Mechanics by Herbert Goldstein, Charles P. Poole, John L. Safko, 3rd. Edition. Addison Wesley, Reading, Massachusetts (2001).
3. Classical Mechanics by Tai L. Chow, John Wiley & Sons (1995).
4. Classical Mechanics by H. Goldstein, 3rd. Edition. Addison Wesley, Reading, Massachusetts (1980).

Differential/integral calculus; Orthogonal coordinate systems (cartesian/cylindrical/ spherical); Electrostatics in free space: Electrostatic force/field/potential/energy for discrete (a single point charge/a collection of point source charges) and continuous (line/surface/volume) charge distributions, Divergence/curl of E, Electrostatic boundary conditions (on E, V, and D), Conductors, Capacitors; Boundary value problems: Solutions of Laplace's equation for various symmetries (cartesian/ cylindrical/spherical), Method of Images for various symmetries; Electric monopole/ dipole/quadrupole/octopole etc., Electric dipole moment for line/surface/volume charge; Electrostatics in matter: Polarization P, Bound surface/volume charge, Electric displacement D, Gauss's law for D & P-differential/integral forms and its uses/applications, Electric susceptibility/permittivity/relative permittivity; Electric line/surface/volume currents- $I/K/J$, Equation of continuity.

Recommended Books:

1. Introduction to Electrodynamics, by David J. Griffiths, 3rd Edition, Prentice Hall, USA, (1999).
2. Field and Wave Electromagnetics, by David K. Cheng, 2nd Edition, Addison Wesley, USA, (1983).
3. Electromagnetic Fields and Energy, by H. A. Haus and J. R. Melcher, 1st Edition, Prentice Hall, USA, (1989).
4. Classical Electromagnetic Theory, by Jack Vanderlinde, 2nd Edition, Kluwer Academic, USA, (2004).
5. Electromagnetic Fields and Waves, by Paul Lorrain and Dale R. Corson, 3rd Edition, W. H. Freeman, USA, (1988).
6. Foundations of Electromagnetic Theory, by John R. Reitz, Frederick J. Milford, and Robert W. Christy, 3rd Edition, Narosa, India, (1998).
7. Electromagnetic Field Theory Fundamentals, by Bhag S. Guru and Hüseyin R. Hiziroğlu, 2nd Edition, Cambridge, UK, (2004).
8. Basic Laws of Electromagnetism, by E. Irodov, 1st Edition, CBS, India, (2001).

Semiconductor Diode And Applications: Semiconductor Diode, Characteristics Curves, DC & AC resistance, Diode Equivalent circuit, Series and Parallel Diode configuration with DC load, Rectification, Half and Full wave rectifier circuit with and without filter circuit, Zener Diode, Light emitting diode. Bipolar Junction Transistor: Transistor and transistor operation, Transistor Configuratio (CB, CE,CC),Current amplification factors, Load line and Operating Conditios, DC biasing (voltage divider bias C-E amplifier),Design of voltage divider bias C-E amplifier, Transistor switching network. Field Effect Transistors: Introduction of FETs, Construction and basic operation JFET, Characteristics and parameter of JFETs, JFETs biasing (voltage divider bias), The metal oxide semiconductor FET(MOSFET), MOSFET parameters and characteristics, Low and High frequency response of FET amplifiers. Negative Feedback Amplifiers: Negative feedback amplifiers,General characteristics of Negative feedback amplifiers, Classification of negative feedback amplifiers, voltage series

feedback amplifier. Integrated amplifier: The Differential amplifier (modes of operation, common mode rejection ratio), Operational Amplifier and its parameters, Op-amp configuration with negative feedback, Op-amp applications (voltage summing, voltage buffer, voltage comparators), Op-amp as differentiator and integrator. Oscillators: Oscillator Principles and conditions for oscillation, Oscillator with LC feedback circuits, Transistor RC phase shift oscillator, Crystal oscillators, UJT relaxation oscillator, Multivibrators, Schmitt trigger.

Recommended Books:

1. Electronic Devices and Circuit Theory By Robert Boylestad and Louis Nashelsky, Prentice Hall, (2002).
2. Principles of Electric Circuits by T.L Floyd, .E. Merrill Pub. Co, (1981).
3. Integrated Electronics by J. Millman & C.C. Halkias, McGraw Hill, (2008).
4. Electronic Devices by T.L. Floyd, Merril Publishing Company Columbus (1988).
5. Electronic Principles by A.P. Malvino, , Tata McGraw Hill, New Delhi (1988).
6. Electronic Devices & Circuits by D.B. Bell, Reston Publishing Company Inc., Virginia (1980).
7. Electronic; Design Circuit & Systems by C.J. Savant Jr. M.S. Roden, G.L. Carpenter, The Bengamin/Cummings Publishing Co. California (1991).
8. Basic electronics by B. Grob, McGraw-Hill, (2003).

PHYS-305 Electronics LAB Cr.H=3(0-3)

The following practicals are recommended for Electronics LAB. Minimum number of practicals to be performed is six.

- To construct from discrete components OR, AND, NOT, NAND, NOR exclusive OR Circuits and verify their truth tables.
- Design a fixed and self bias and voltage divider bias transistor To construct a single stage CE transistor voltage amplifier and study gain, input impedance, output impedance, and half power points by sine/square wave testing and effect of bias on the output and measurement of distortion
- To construct and study the wave forms at the base and collector of the transistors of a free running a multivibrator. To construct and study of the height, duration and time period of the output pulses in a monostable and Bistable multivibrators with reference to the input Trigger
- To study of RC integrators and differentiators.
- Design an inverting and non-inverting D.C. amplifier, measurement of parameters of a given IC operational amplifier.
- Design and study the application of operational amplifier (current to voltage converter, instrumentation amplifier, buffer, voltage clamp, integrator, and differentiator. Low and high pass filter half-wave rectifier etc.)
- To construct a phase shift or Wein bridge oscillator and measure its frequency by 741,555 timer

Recommended Books:

1. Experimental Electronics by R.J. Higgings (McGraw-Hill).

Semester-VI

PHYS-306 Methods of Mathematical Physics-II Cr.H=3(0-0)

Legendre Functions: Generating Functions, Recurrence Relations, Orthogonality, Associated Legendre Functions, Spherical Harmonics, Orbital Angular Momentum Operators, Legendre Function of the second kind, Laguerre Functions, Hermite Functions, Chebyshev Polynomials. Fourier Series: Definition and general properties of Fourier series, Uses and Applications of Fourier Series, Gibbs Phenomenon, Discrete Fourier Transform. Integral Transforms: Development of Fourier Integral, Fourier Transforms and Inversion Theorem, Fourier Transforms of Derivatives, Convolution Theorem, Momentum Representation, Transfer Functions, Laplace Transform and its Application, Inverse Laplace Transform.