SyracuseUniversity-DepartmentofPhysics

Physics212-Summer1996

- Textbook: **Halliday/Resnick/Walker.FundamentalsofPhysics.C   hapters23-42.**
- SchedulingNotes:
  - ClassesstartonTuesday,July2.
  - NoclassonThursday,July4.(UniversityHoliday.)
  - NoclassonFriday,July5.(Should-have-beenaUni   versityHoliday.)
  - NoclassonFriday,July12.

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- ## **HomeworkAssignments**
- ## **TheSyllabus**
- ## **ScheduleofImportantDates**
- ## **GradingPolicy**

- ## **SyllabusIdeas** (ifyouwanttoseewhatI'mthinkingabout)
- ## **PhotoAlbum**

- ## **VisualizationviaJAVA**
- ## **VisualizationviaVRML**

Syracuse University PHYSICS

Physics212-Summer1996

Syllabus

Meetingtimes:

- `LECTURE    with ROB:       MTWTh  8:30am-10:00am`
- `RECITATION with MIKE:      MTWTh 10:00am-11:00am`
- `LAB        with PANAYOTIS: M W    2:30pm- 4:30pm`

Calendar

```
                   1996
              SUMMER-SESSION II
        July                      August
Sun MON TUE WED THU Fri Sat   Sun MON TUE WED THU Fri Sat
         2   3   4   5   6                         1   2   3
 7   8   9  10  11  12  13     4   5   6   7   8
14  15  16  17  18  19  20
21  22  23  24  25  26  27
28  29  30  31
```

July2-July5

Tuesday-July2

ElectricCharge

- Twospecies(positive,negative)
- Quantized
- Conserved
- MATH:(algebra)

ElectricForceonanElectricCharge

- Coulomb'sLaw:Theforcebetweentwopointcharges   is
    - proportionaltothemagnitudeofeachcharge,
    - inverselyproportionaltothesquareoftheirsepar   ation,
    - actsasavector,alongthelinejoingthecharges.
- Superpositionandmorecomplicatedchargedistribut   ions

- That'sallthereisforelectrostatics.Giventhec hargesandtheirpositions,wecanfindallofthe electricalforces.
- MATH:(vectoralgebra)

ElectricChargesinMatter

- Qualitatively:
  - ChargingbyRubbing,ConductionandInduction
  - TheElectricDipole
  - Conductors,Insulators,Semiconductors

Wednesday-July3

🔴LAB:I.ElectricCharges

ElectricVectorField

- vectorfields
- standard:forceperunitchargeE=F/q
- whatit'sgoodfor:
  - computationalconvenience,incorporatesCoulomb'sL aw
  - interaction-at-a-distanceisabadthing,according relativity
  - theelectricandmagneticfieldhavelivesoftheir own(electromagneticwaves)
- examples:electricfieldduetoasphereofcharge, alineofcharge,aringofcharge,adiskofchar ge,aplaneofcharge
- MATH:(integralcalculus)

Hintat: **ElectricFluxthroughasurface**

- Gauss'sLawisafancyformofCoulomb'sLaw
- Wewilldothislater.

ConductorsandDielectrics

- ElectricField(vector)iszerothroughoutthemeta loftheconductor,andperpendiculartothesurfac esoftheconductor.
- examples:thelightningrod,thephotocopier

Thursday-July4

Noclass. Universityholiday.

Friday-July5

Noclass. Thursdayclassesaresupposedtobemadeuptoday. ButbecauseIexpectattendancetobelow,Ithoug htitisbest
tocancelthisclassaltogether.

July8-July11

Monday-July8

🔴LAB:II.ElectrostaticFields

ElectricPotentialEnergyandElectricPotential

- Chargesinelectricfields.TheElectricDipole.
- Workdoneistheline-integraloftheforcealonga   givenpath.
- Potential-energycanbedefinedonlyiftheforce-f   ieldisconservative.
- Thenascalarfieldcanbedefinedas:
  theworkdoneperunitchargeagainstthefieldin   ordertoassembleagivenconfigurationofcharges
- MATH:(integralcalculus,vectorcalculus)

ConductorsandDielectrics

- ElectricPotentialisconstantthroughoutthemetal   oftheconductor
- Afewmorewordsaboutinsulators
- someeverydayexamples

Tuesday-July9

ElectricEnergy

- ElectricEnergystoredinthefieldbyvirtueofa   configurationofcharges
- application:TheCapacitor
- MATH:(algebra)

Wednesday-July10

LAB:III.ElectricalResistance

ElectricCurrent

- Currentiselectricchargeinmotion.Netflowofc   hargeiswhatisimportant.
- Resistance,Ohm'sLaw,Conductivity
- Application:DCCircuits
- MATH:(algebra,simpletopology)

Thursday-July11

ElectricCircuits (continued)

duringRECITATION: **SHORT-EXAM1:** MaterialuptoandincludingTuesday-July9

Friday-July12

Noclass.

July15-July18

Monday-July15

LAB:VI.OscilloscopeanditsApplication

MagneticChargesandMagneticDipoles

- Therearenoisolatedmagneticcharges.
- TheMagneticDipole.

MagneticForceonanElectricCharge,onanElectri   cCurrent,onaMagneticDipole

- example:television,cyclotron
- MATH:(vectors,crossproduct)

Tuesday-July16

MagneticVectorField

- Biot-Savart'sLawisanalogoustoCoulomb'sLaw
  MagneticFieldduetoElectricCurrentsources
- MATH:(integralcalculus)

Ampere'sLaw

- Ampere'sLaw:thenetcurrentflowingthroughtheo   pensurfaceenclosedbyahypotheticalclosed-loop   isproportionalto
  theline-integralofthemagneticfieldalongthat   closed-loop
- Ampere'sLawisafancyformofBiot-Savart'sLaw
- MATH:(vectorcalculus)

Wednesday-July17

🔴LAB:V.MotionsofElectronsinElectricandMagne   ticFields

MathematicalInterlude:FLUX

ElectricFluxthroughasurface

- densityofelectricfieldlines
- Gauss'sLaw:thenetelectricchargecontainedint   hevolumeenclosedbyahypotheticalclosed-surface   isproportionalto
  theflux-integraloftheelectricfieldthroughtha   tclosed-surface
- Gauss'sLawaisafancyformofCoulomb'sLaw
- MATH:(fluxofavectorfield)

Thursday-July18

MagneticFluxthroughasurface

- PreparationforFaraday'sLaw

🔴🔴duringRECITATION: **SHORT-EXAM2:** MaterialuptoandincludingTuesday-July16

July22-July25

Monday-July22

🔴LAB:VI.ElectromagneticInduction

MagneticInduction

- Faraday'sLaw:Time-VaryingMagenticFlux"induces"   a(non-Coulombic)electricfield
- Biscalledthemagneticinduction
- non-coulombicelectricfieldsarecreated(nomore   equipotentialsurfaces)
- Faraday'sLawis"F=ma"(theequationofmotion)as   "EMF=d/dt(FLUXOFB)=d/dt(Li)"
- example:the(dynamo)motor

Tuesday-July23

MagneticEnergy[Density]

- MagneticEnergystoredinthefieldbyvirtueofa   configurationofcurrents
- application:TheInductor(the"magneticanalog"of   thecapacitor)

Wednesday-July24

LAB:VII.RCandLCCircuits

ElectromagneticEnergyConservation

- TheLCcircuit(harmonicoscillator)
- Mechanicalanalogies
- application:radio
- MATH:(algebra)

Thursday-July25

ElectricInduction

- "DisplacementCurrent"isabadname
- Maxwell'sLaw:Time-VaryingElectricFlux"induces"   a(non-Biot-Savart)magneticfieldisduetoatim   e-changingelectric
  field
- Discalledtheelectricinduction
- whyweneedit
  - Conservationofcharge-current
  - Symmetry,Relativity
- application:byitselfnothing...butcombinedwith   theotherlawsofelectrodynamics,itleadstoMax   well'sEquations.
- MATH:(calculus)

Maxwell'sEquations

- TheElectromagneticFieldhasalifeofitsown:
  ElectromagneticWaves(RadiationandLight!)
- applications:oh,somany...

duringRECITATION: **SHORT-EXAM3:** MaterialuptoandincludingWednesday-July24

July29-Aug1

Monday-July29

🔴LAB:VIII.ReflectionandRefractionofLight

ElectromagneticWaves (continued)

- TheSpectrumanditsApplications:Light,Radio,TV   ,X-Rays,Microwaves
- MATH:(algebraanddifferentialcalculus)

Tuesday-July30

GeometricOptics

- LawofReflection
- LawofRefraction
- FermatPrincipleofLeastTime
- MATH:(algebra,geometry,anddifferentialcalculus   ,minimization)

Wednesday-July31

🔴LAB:IX.PolarizationofLight

PhysicalOptics

- Polarization
- applications:sunglasses,LEDdisplays

Thursday-August1

PhysicalOptics

- Diffraction
- Interference
- applications:thin-filmlenscoatings

🔴🔴duringRECITATION: **SHORT-EXAM4:** MaterialuptoandincludingTuesday-July30

Aug5-Aug8

Monday-August5

🔴LAB:X.SpectrumofLight

SpecialTopics: **Superconductivity**

- GuestlecturebyyourTA,MikeFaleski.

RECITATION:ReviewforFINAL.

Tuesday-August6

SpecialTopics: **CircuitAnalysis**

- Multiloop
- MATH:(algebraanddifferentialequations)

RECITATION:ReviewforFINAL.

🔴🔴duringRECITATION: **SHORT-EXAM5:** MaterialuptoandincludingThursday-August1

Wednesday-August7

SpecialTopics: **GeometricOptics:OpticalInstruments**

- Lenses
- Mirrors
- TheEye,Telescopes,Microscopes
- MATH:(geometry,trigonometry,andmatrixalgebra)

RECITATION:ReviewforFINAL.

Thursday-August8

🔴🔴🔴duringLECTUREandRECITATION:(Optional)   **FINAL-EXAM:**Cumulative:

Thispageismaintainedby   *salgado@physics.syr.edu*