Government Degree College, Nandikotkur

1.1.1: The Institution ensures effective curriculum planning and delivery through a well-planned and documented process including Academic calendar and conduct of continuous internal Assessment

TEACHING SYNOPSIS 2018-19

TEACHING NOTES ACADEMIC YEAR

Unit-II → conditions for Interference, (Yud) mirror

Academic Year : 2018-19

Name Of The Topic: Interference of light

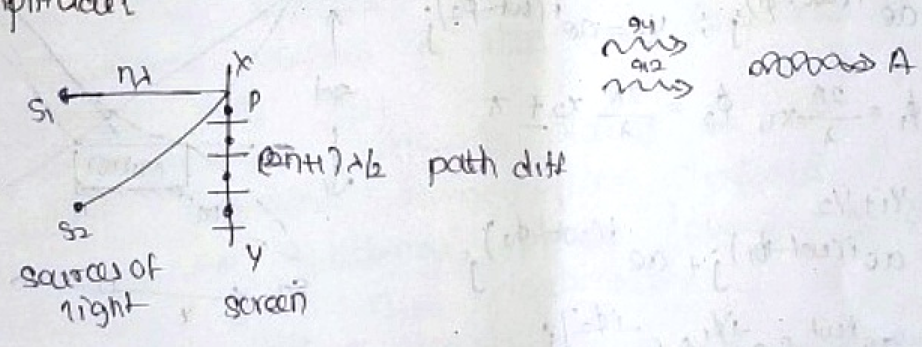
Course : physics

Hours Required	2hrs
Learing Objectives	1. To able to know the conditions of interference 2. To know about interference of light. 3. To study about interference.
Previous Knowledge To Be Reminded	Interference conditions.

Topic Synopsis : Conditions for Interference

1. when 2 point sources, have some phase relation, then the dots are bright, dashes are dark
2. when 2 sources have phase difference π, dots are dark, dashes are bright
3. when 2 sources have constant phase difference between them then dots are bright, dashes and dark

Interference of light by division of wavefront and amplitude:



Teaching Aids Used	Black board, Projector.
Additional Inputs taught	PPt
References cited	Sk. Gupta
Student Activity Planned After The Teaching	charts, ppt.

Signatur of the Lecturer /Reader

Signatur of the Lecturer I/C of the Dept

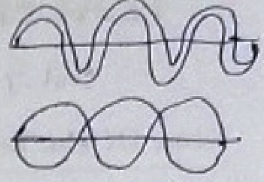
Signature of the Principal

The superposition of 2 different waves.

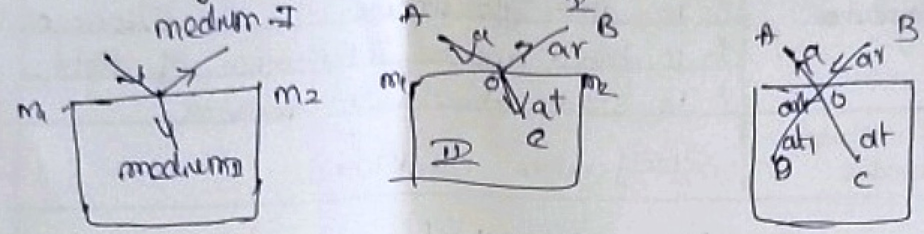
The change in distribution of intensity / amplitude in region of superposition

If $A = a_1 + a_2 \longrightarrow$ construction interference

If $A = a_1 - a_2 \longrightarrow$ destructive interference



Phase change on reflection - Stokes treatment



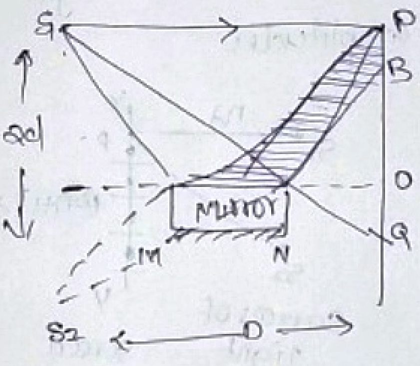
$$art + atr' = 0$$
$$at(r + r') = 0$$
$$r + r' = 0$$
$$r = -r'$$

This shows the change of π in phase change on reflection.

Lloyd's Single Mirror

$y_1 = ae^{i(\omega t - \phi_1)}\hat{j}$; $y_2 = ae^{i(\omega t - \phi_2)}\hat{j}$

where $\phi_1 = \frac{2\pi}{\lambda} x_1$, $\phi_2 = \frac{2\pi}{\lambda} x_2 + \pi$



$$y = y_1 + y_2$$
$$= ae^{i(\omega t - \phi_1)}\hat{j} + ae^{i(\omega t - \phi_2)}\hat{j}$$
$$= ae^{i\omega t}[e^{-i\phi_1} + e^{-i\phi_2}]\hat{j}$$
$$= ae^{i\omega t}[(\cos\phi_1 + \cos\phi_2) - i(\sin\phi_1 + \sin\phi_2)]\hat{j}$$
$$= e^{i\omega t}[R\cos\theta - iR\sin\theta]\hat{j}$$

let $R\cos\theta = a\cos\phi_1 + \cos\phi_2$, $R\sin\theta = a\sin\phi_1 + \sin\phi_2$

$$y = Re^{i\omega t}(e^{-i\theta})(\hat{j}\cdot\hat{j})$$
$$= Re^{i\omega t}(e^{-i\theta})$$
$$y = Re^{i(\omega t - \theta)}$$

Total displacement

TEACHING NOTES ACADEMIC YEAR

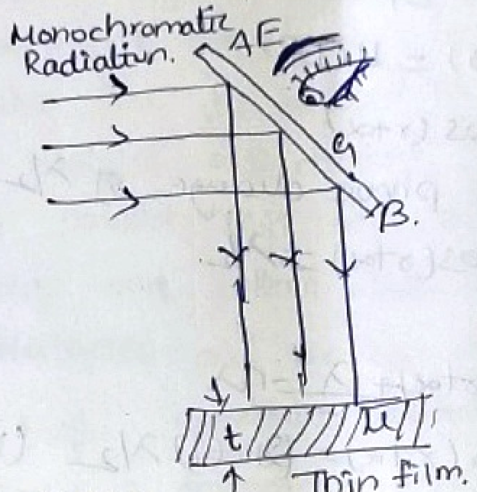
Academic Year : 2018 - 19

Name Of The Topic Plane parallel film wedge shaped film

Course : physics

Hours Required	1hr
Learing Objectives	1. To able to know about monochromatic radiation 2. To study about the widge shaped film 3. To know about the plane parallel film
Previous Knowledge To Be Reminded	Monochromatic light, radiation

Topic Synopsis :



(1) The wave reflected from lower surface of the film traverses an additional path $2\mu t$

(2). when the film is placed in air, wavefront reflected from upper surface under goes an additional phase change of π

$2\mu t = n\lambda$ destructive

$2\mu t = (2n+1)\lambda/2$ constructive

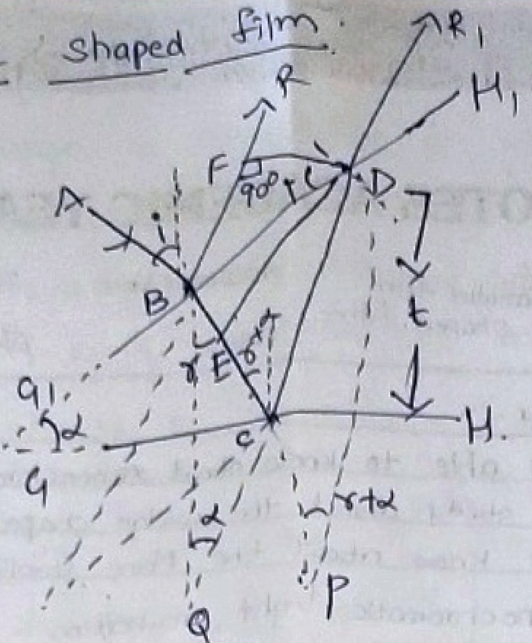
Teaching Aids Used	Black board, Projector, charts
Additional Inputs taught	PPT
References cited	SK. Gupta
Student Activity Planned After The Teaching	charts PPT

Signatur of the Lecturer /Reader

Signatur of the Lecturer I/C of the Dept

Signature of the Principal

Wedge shaped film.



$\Delta = \mu(BC + CD) - BF$

$= \mu(EC + CD) = \mu(ER)$

$= 2\mu t \cos(r+\alpha)$

Due to reflection phase change of $\lambda/2$

$\Delta = 2\mu t \cos(r+\alpha) \pm \lambda/2$

$\Delta = n\lambda$

$2\mu t \cos(r+\alpha) \pm \frac{\lambda}{2} = n\lambda$

$2\mu t \cos(r+\alpha) = (2n \pm 1)\lambda/2$ (max)

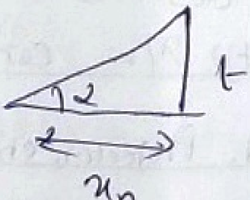
destructive interference

$\Delta = (2n \pm 1)\lambda/2$

$2\mu t \cos(r+\alpha) \pm \lambda/2 = (2n \pm 1)\lambda/2$

$2\mu t \cos(r+\alpha) = n\lambda$

$n = 0, 1, 2, 3 - - - -$



$2\mu t \cos\alpha = (2n+1)\lambda/2$

$2t \cos\alpha = (2n+1)\lambda/2$

$2x_n \tan\alpha \cos\alpha = (2n+1)\lambda/2$

$2x_n \sin\alpha \; (2n+1)\lambda/2$

fringe width $\beta = \frac{\lambda}{2\sin\alpha} = \lambda/2\alpha$.

TEACHING NOTES ACADEMIC YEAR

Academic Year : 2018-19.

Name Of The Topic Newton's rings – experiment, colours of thin film **Course :** physics

Hours Required	2hrs.
Learing Objectives	1. To know about the Newton's rings.
	2. To know the colours of thin film.
	3. To verify the experimenta. Arrangements
Previous Knowledge To Be Reminded	Monochromatic light, film.

Topic Synopsis : colours of thin film:

when a thin film is exposed to white light source beautiful colours are observed. when the incident light falls on parallel thin film, it split up into reflection at top and bottom. These rays interfere and forms interference and we see diff colours.

dark and bright appearance depends on cut, colours of reflected & transmitted rays are complementary

Newton's rings:

If the monochromatic light is allowed to fall normally and the film is viewed in reflected light alternate dark

Teaching Aids Used	Black board, ppt projector, experimental Arrangement.
Additional Inputs taught	PPt
References cited	SK Gupta
Student Activity Planned After The Teaching	charts, PPt.

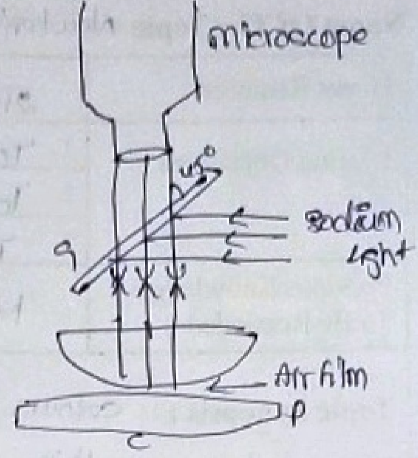
Signatur of the Lecturer /Reader

Signatur of the Lecturer I/C of the Dept

Signature of the Principal

and bright rings are formed around the point of contact b/w lens and glass plate. These rings are called Newton's rings.

<u>Experimental Arrangement</u>: It consists of a glass plate on which plano convex lens is placed so that air film is formed at point of contact. Light from sodium lamp falls on glass plate G arranged in 45° angle and then reflected light falls on lens. The reflected light from lens is observed through microscope. Two reflected rays interfere and forms interference patterns.



$2t + \frac{\lambda}{2} = n\lambda$

Path diff : $2\mu t \cos r + \lambda/2$

$2t + \lambda/2 = n\lambda$

$2t = (2n-1)\lambda/2$ (bright)

$2t = n\lambda$ (dark)

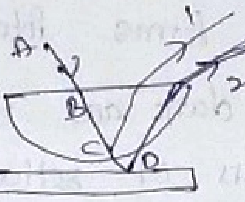
$t = r^2/2R$

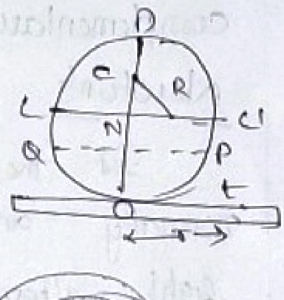
$\frac{2r^2}{2R} = (2n-1)\lambda/2$

$r^2 = \frac{(2n-1)\lambda R}{2}$

$\frac{D^2}{4} = \frac{(2n-1)\lambda}{2} R$

$D \propto \sqrt{2n-1}$





For dark rings

$\frac{2r^2}{2R} = n\lambda$

$r^2 = n\lambda R$

$D^2 = 4n\lambda R$

$D = 2\sqrt{n\lambda R} \propto \sqrt{n}$

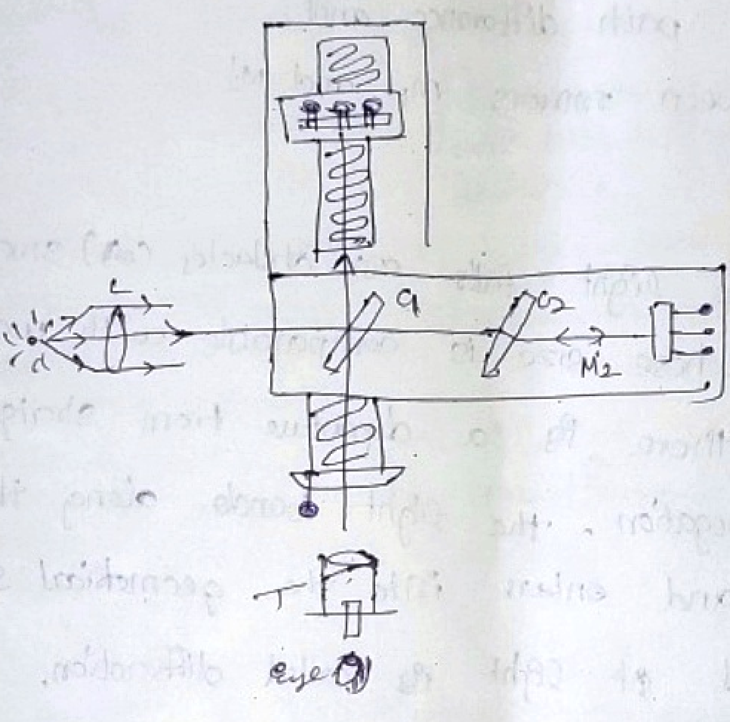
TEACHING NOTES ACADEMIC YEAR

Name Of The Topic michelson Interferometer Diffraction Introduction **Academic Year :** 2018-19

Course : physics

Hours Required	1 hr.
Learing Objectives	1. To know about the Diffraction. 2. To know the working of Michelson Interferometer 3. To know the path difference.
Previous Knowledge To Be Reminded	Diffraction.

Topic Synopsis : Michelson Interferometer



Teaching Aids Used	Black board, Projector,
Additional Inputs taught	ppt
References cited	Sk Gupta
Student Activity Planned After The Teaching	charts, ppt.

Signatur of the Lecturer /Reader

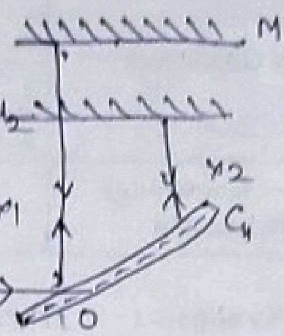
Signatur of the Lecturer I/C of the Dept

Signature of the Principal

It consists of two plane highly polished mirrors M_1 and M_2 $\perp^r$ to each other. Two glass plates G_1 and G_2 are at $45°$ angles. They are semi silvered M_1 and M_2 are mounted on carriage with 3 levelling screws. so that they move up and down

$\Delta = 2(x_1 - x_2)$ Cheavily silvered

$\Delta = 2(x_1 - x_2) \pm \lambda/2$



Interference fringes may be straight, circular (or) parabolic depending on path difference and angle between mirrors M_1 and M_2

Diffraction:

When the light falls on obstacles (or) small aperture whose size is comparable with wavelength of light, there is a departure from straight lines propagation. the light bends along the obstacles. and enters into the geometrical shadow. This bend of light is called diffraction.

TEACHING NOTES ACADEMIC YEAR

Name Of The Topic → Difference b/w Fresnel and Fraunhoffer
→ Fraunhoffer diffraction at single slit.

Academic Year : 2018-19

Course : physics

Hours Required	1hrs
Learing Objectives	1. To know about fresenel and fraunhoffer 2. To understand fraunhoffer diffraction 3. To study Diffraction
Previous Knowledge To Be Reminded	Fraunhoffer's Diffraction at Single slit

Topic Synopsis :

Fresne's diffraction	Fraunhofer's diffraction
1. source and screen are finite distances	1. Source and screen are at infinite distances
2. No lenses are used	2. Convex lens are used
3. spherical (or) cylindrical wavefront	3. plane wavefront
4. Diffraction pattern is studied in the direction of Propagation of light	4 studied in any direction

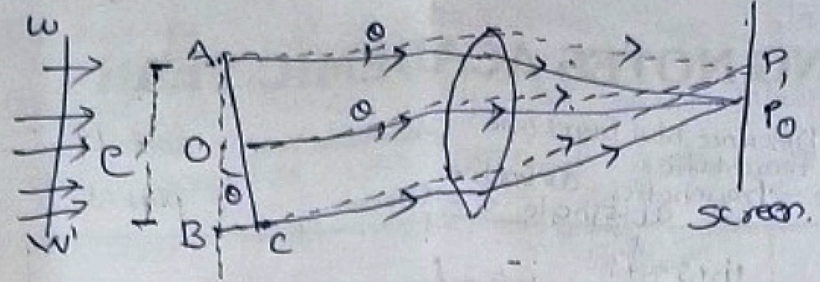
Teaching Aids Used	Black Board, Charts
Additional Inputs taught	PPT
References cited	SK. Gupta.
Student Activity Planned After The Teaching	charts PPT

Signatur of the Lecturer /Reader

Signatur of the Lecturer I/C of the Dept

Signature of the Principal

Fraunhofer diffraction at single slit:



Path difference b/w secondary wavelets,

$= BC = AB\sin\theta = e\sin\theta$.

Phase difference $= \frac{2\pi}{\lambda} e\sin\theta$.

slit is divided into n parts. for each part amplitude is a. then total phase diff

$= \frac{1}{n}(\text{total phase}) = \frac{1}{n}\left(\frac{2\pi}{\lambda} e\sin\theta\right)$

$= d$ (say)

$$R = a\frac{\sin nd/2}{\sin d/2} = a\frac{\sin(\pi e\sin\theta/\lambda)}{\sin(\pi e\sin\theta/(n\lambda))}$$

$$= a\frac{\sin\alpha}{\sin\alpha/n}$$

$$= a\frac{\sin\alpha}{\alpha/n} = na\frac{\sin\alpha}{\alpha}$$

$$R = A\frac{\sin\alpha}{\alpha}$$

$n \to \infty \quad a \to 0 \quad na = A$

$$I = R^2 = A^2\frac{\sin^2\alpha}{\alpha^2}$$

$$I = I_0\left(\frac{\sin\alpha}{\alpha}\right)^2$$