



The Abdus Salam
International Centre
for Theoretical Physics
50th Anniversary 1964 - 2014



An offline course for Physics and Engineering

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Technology Section
ICTP

*Conference on Open-source tools for enhancing teaching, learning and research in
Science, Technology, Engineering and Mathematics (STEM).
UNAH, Tegucigalpa, Honduras – April 9th, 2014*

Overview

- Introduction
- ICTP Diploma programme
- E-learning platform
- Open Educational Resource
- Open Offline course
- Conclusion

INTRODUCTION

Developing countries

- Using OERs and MOOCs from developing countries
 - INTERNET access in educational institutions
 - Institutional
 - Filtered and crowded
 - Personal
 - Mobile devices

Example – Mobile Internet data rates in Nigeria, January 2014

Period (Days)	Data Bundle	Cost	
		Naira (NGN)	Dollar (USD)
1	10MB	100	0.63
1	50MB	200	1.25
7	25MB	400	2.50
30	3GB	6500	40.63
30	5GB	8000	50.00

Notes:

- Exchange rate: 160 NGN = 1 USD
- Possibly biggest mobile provider in Nigeria and Africa
- Costing by quantity not quality or rate.

@250MB/hour:

50 USD = 25 hour long videos

Using OERs

- Access quality (and speed)
 - Using multiple providers
- Access on-demand
 - Downloading for later use is only possible when it is cost effective..

ICTP DIPLOMA PROGRAMME

Origins

- *Reduce the gap in international level advanced training for graduate students in developing countries.*
 - Early 1990s: key areas
 - Condense matter physics, High Energy physics, Mathematics & Earth System Physics (later)
 - 2007 - 2012: special focus on African students
 - Pre-diploma: Final exam, no thesis.

Pre-diploma programme – 2011/12

Course title	Lecturers	Tutors
Quantum mechanics	1	1
Mathematical methods	1	1
Classical mechanics	1	0
Advanced Electromagnetism	1	0
Advanced Quantum mechanics	1	0
Statistical mechanics	1	1
Solid State Physics	1	0
Physics of the Earth System	4	0
Relativistic Quantum Mechanics	1	0

Mathematical methods, Advanced Electromagnetism, Quantum mechanics and Solid state Physics is also taught in Engineering

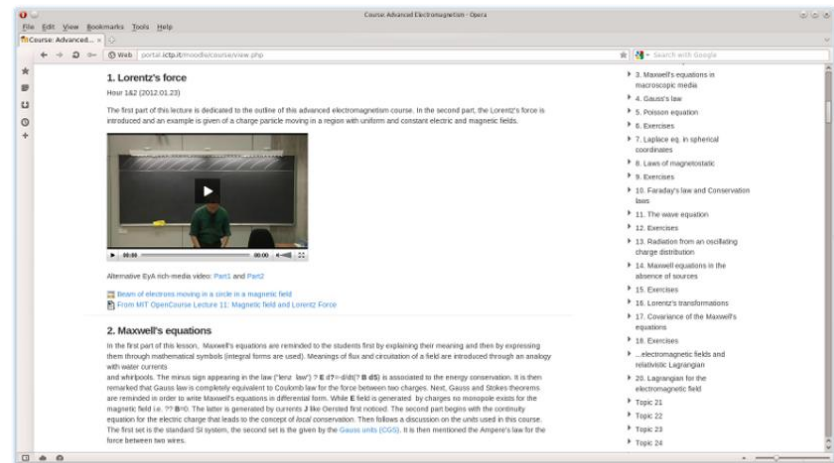
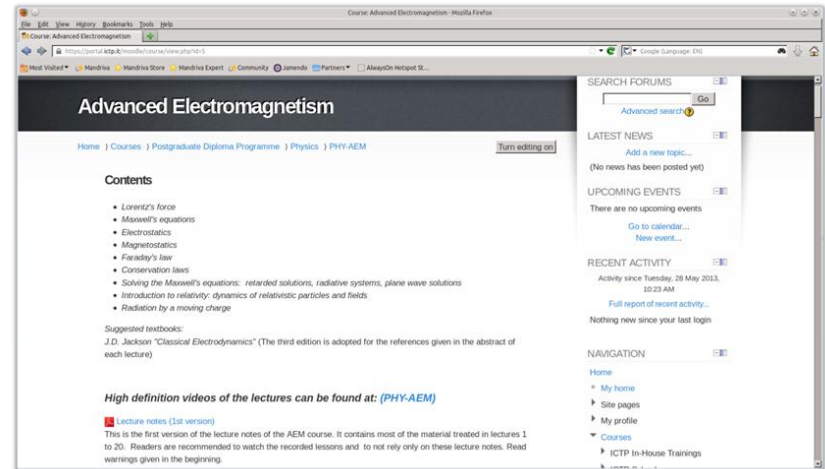
Multi-ethnic class – 2011/12

Country	Number	Language
Togo	1	French
Kenya	2	English/Swahili
Ethiopia	2	Amharic/English
Bangladesh	1	Bengali/English
Uganda	1	English
People's Republic of Congo	2	French
Sudan	3	Arabic/English
Zimbabwe	1	English
Nigeria	1	English
Bolivia	1	Bolivian Spanish

E-LEARNING (B-LEARNING)

E-learning platform – 2011/12

- MOODLE
 - Cost
 - Multi use
 - Rich-media
 - Interactive
 - Questions & grading
 - Allows learners to focus on learning
- 12 instructors, 18 tutors & 15 students
 - <http://portal.ictp.it/moodle>



Online

OPEN EDUCATIONAL RESOURCE

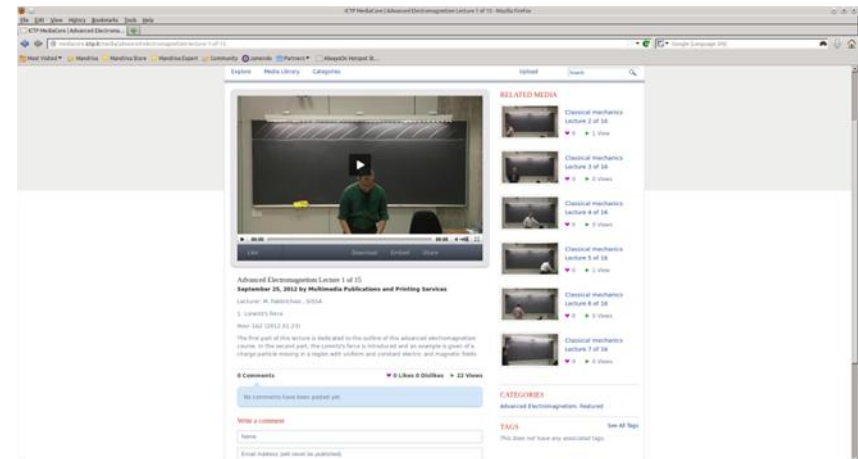
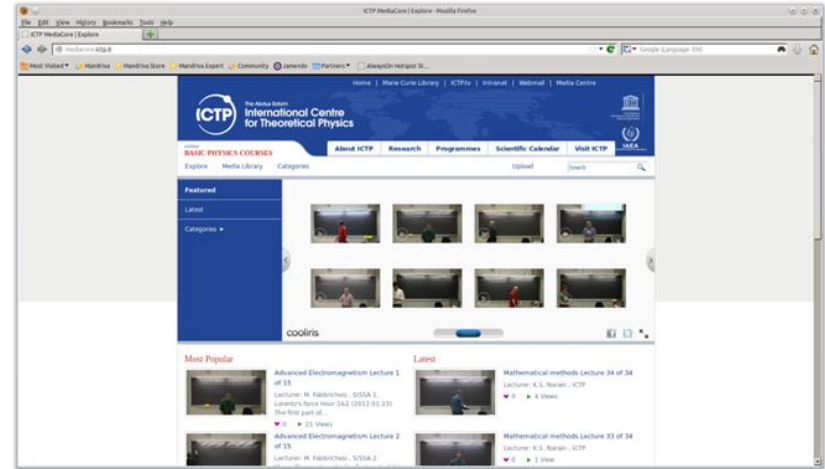
Analysis of academic video recording techniques and repositories (June - 2012)

Technique	Effort	Storage	Quality
Screencast	low	50MB/hour	Medium
Webcam	Low	100MB/hour	Low
Webcast	Low	150MB/hour	Medium
Manned video	High	200MB/hour	High

Repository	Effort	Costs	Quality	Downloadable
YouTube	Low	Low	Low –High	No
iTunes U	High	Medium	Medium – High	Yes
Internet Archive	Low-High	Low – medium	Low – High	Yes
ICTP.tv	Low	Medium	Low - medium	Yes

Media Portal for Blended Learning

- Video portal
 - Mediacore Community Edition (MediaDrop)
 - Customizable/branding
 - Support for non-video files (PDF)
 - Collaborative use
 - Collaborative sharing from video page via Facebook, twitter and E-mail
 - <http://mediacore.ictp.it/>



Creating the archive

Course code	Course title	Recorded hours
PHY-AQM	Quantum mechanics	<i>Processing</i>
PHY-MM	Mathematical methods	68
PHY-CM	Classical mechanics	32
PHY-AEM	Advanced Electromagnetism	30
PHY-AQM	Advanced Quantum mechanics	60
PHY-SM	Statistical mechanics	58
PHY-SSP	Solid State Physics	40
PHY-PES	Physics of Earth System	36
PHY-RQM	Relativistic Quantum mechanics	36

Total is 360 hours in about 180 files

From moodle to mediacore

- Scripts/utilities were developed to
 - Batch upload of videos into mediacore
 - UNIX shell script
 - Pedagogical content from moodle (Perl)
 - Linked lists of HTML content extracted from moodle database reformatted for insetion into mediacore Database. (Both were MySQL)
 - Video content from mediacore (Perl)

Video portal - Usage statistics

Course title	Views	Likes	Dislikes
Mathematical methods	239	142	142
Classical mechanics	136	62	58
Advanced Electromagnetism	188	68	69
Advanced Quantum mechanics	245	112	118
Statistical mechanics	206	115	113
Solid State Physics	157	77	78
Physics of the Earth System	150	71	72
Relativistic Quantum mechanics	133	71	71

Table covers June – December 2013

Total views is 1454 or average of 8 viewing per video

OPEN OFFLINE COURSE

Creating the off-line archive

- Using Scripts and open source tools
 - Main tool for this is httrack but it could not handle Javascript.
 - Perl based tool to
 - Split HTML page from video portal into header, body and footer.
 - Modify header, footer, change absolute to relative URI
 - Replace Javascript viewer with plain HTML code
 - List additional resources
 - Recombine all sections to new HTML file

Final product - Characteristics

- Portable archive (USB disk)
 - Video lessons
 - 3 click access to any video
 - Works without additional plugins in HTML5 browsers
 - Multiple usage
 - Personal learning
 - Collaborative classroom
 - Licensed under Creative commons

Welcome page

- Information and links
 - Usage models
 - Personal use
 - Classroom use
 - Intranet use
 - Terms of use
 - Free to modify, use ..
 - Menu on left hand side



Subject view

- Right hand side lists of video thumbnails
- Additional information such as name of instructor/speaker

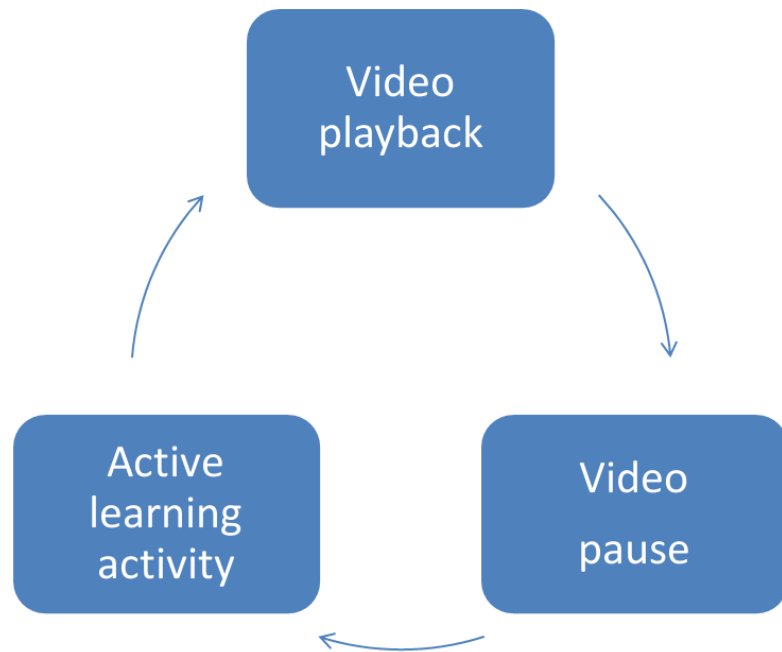


Single video lesson

- Right hand side is now clickable image of video and pedagogical content.
- Additional navigation aids (Previous and Next videos).
- Browser back button returns from video.

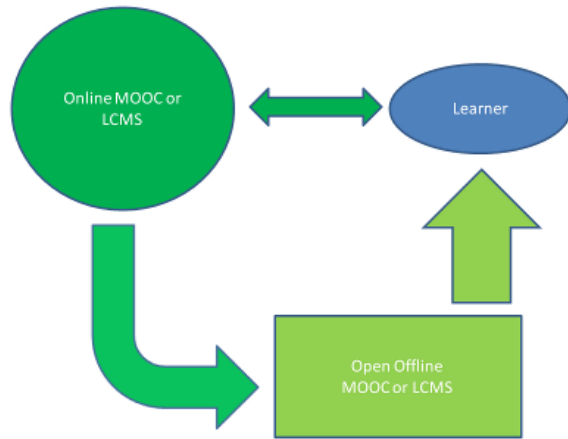


Classroom and LAN/intranet usage

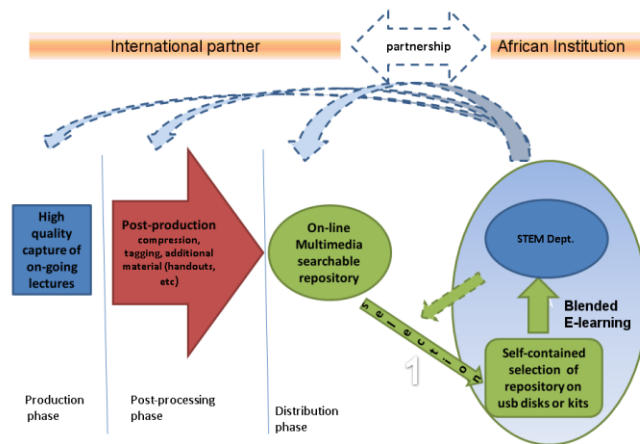


- Projection to large screen possible to high quality of video.
- Groups of learners together with instructors
- Small size and formatting allows direct use from intranet server.

Aid for online resource



- Online access is for
 - Interactions with other learners
 - Submission of assignments

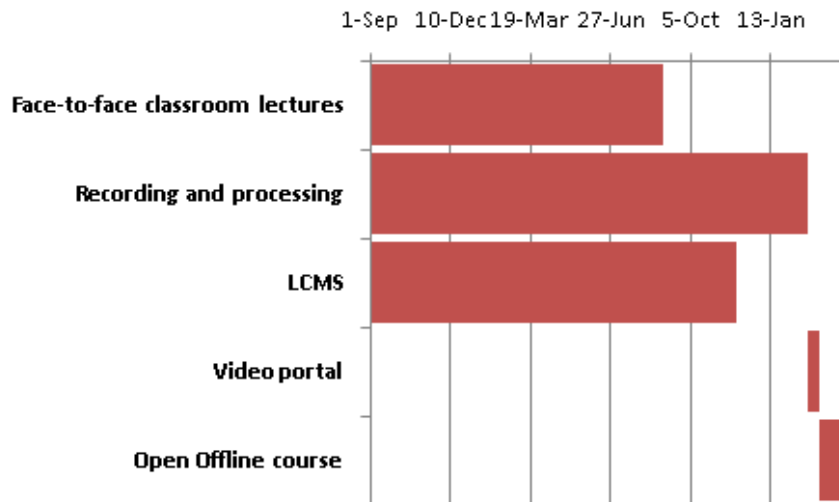


Distribution/availability

- Single 320GB USB disk or 6-8 subject based flash (USB key) disks.
- Disk includes HTML5 browser for Mac, Windows and Linux
- Massive distribution
 - Physics & Engineering
 - Involves a subject instructor.

Institution	Usage
4 universities/ institutions in Nigeria	Personal and classroom
1 University in Ethiopia	Personal and Intranet
1 University in South Africa	Personal and classroom
1 University in Senegal	Personal
1 University in Ghana	Personal
1 University in Cameroon	Personal
MCTP in Mexico	-
Others	-

From moodle to offline archive



- Semi-automated approach
 - 2 man weeks for producing offline archive.
 - Post processing of video files took longest time.
 - Moodle was used for the grading as well.

CONCLUSION

Acknowledgements

- ICTP, Italian Government and UNESCO
 - Support for recording of the lessons and creation of the open offline course
- Multimedia and Publication Unit, ICTP
 - Manned recording
- Lecturers of the diploma in Physics (2011/12)
- Students of the diploma in Physics (2011/12)
- ICTP post-doctoral fellows and other ICTP staff and scientists.

Conclusion

- Offline open Course for Physics and Engineering may be used completely offline and/or from areas with limited bandwidth to the INTERNET.
- The approach may be applied and used for existing OERs including MOOCs and other e-learning platforms.