

E-CONTENT DEVELOPMENT
(A compilation of Best Practices by)

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TABLE OF CONTENTS

Item No.	DESCRIPTION	Page No.
1.	INTRODUCTION	1-1
2.	OBJECTIVES	1-1
3.	PRE-REQUISITES, ROLES AND RESPONSIBILITIES OF CONTENT WRITER	1-2
4.	E-CONTENT MODULE - THE FOUR QUADRANT	4
5.	CHECKLIST	
6.	PROCESS, STEPS AND ROLE AND RESPONSIBILITIES IN DEVELOPMENT OF E-CONTENT MODULE	
7.	TIME-FRAME FOR E-CONTENT DEVELOPMENT—ONE MODULE	
8.	CONTENT DEVELOPMENT	
9.	CURRICULUM AND PEDAGOGICAL STANDARDS	
10.	CONTENT DELIVERABLES	

1. Introduction

The MHRD, under its National Mission on Education through ICT (NME-ICT), has allocated funds to the Consortium of Educational Communication (CEC) for development of e-content for 87 under graduate (UG) subjects. The content and its quality are key components of a robust teaching-learning system. It is proposed to create high quality, curriculum-based, interactive content in different subjects across all disciplines of social sciences, arts, fine arts & humanities, natural & mathematical sciences and linguistics and languages. E-Content, so developed would be available on open access through a dedicated Learning Management System.

Development of e-content is a specialized job requiring skills of a video producer, web designer and instructional designer. However, a faculty or a scientist involved in teaching and research is perfectly suitable and capable of preparing basic materials that can be transformed into e-content with intervention of web designer and professionals with ICT skills.

This document is designed to guide content writer to write an e-content module for a given paper along with description of multimedia contents and instructions to graphical designer/ animator.

2. Objectives

Objectives of this document are as follows:

- To develop e-teaching materials in a creative way without IT expertise.
- Enable exploration of more usable presentation in the context of e-learning content creation through models, practical examples and checklists.
- To develop e-content using contemporary ICT.
- To maintain uniformity and follow appropriate standards for interoperability.

3. Pre-requisites, Roles and Responsibilities of Content Writer/Subject Matter Expert

Subject Matter Experts are academics with sufficient experience in teaching and optionally have past experience in creating content in the area they have specialised. They should have been involved in academic activities at UG or PG level. Those who have prior exposure to on-line teaching-learning related activities such as creation of on-line content, course design, delivery etc., would be an added advantage. In case academics with such exposure is not

available, academic who has experience in on-line course preparation could be co-opted into the team. Content writing could be accomplished by the subject matter expert by co-opting academics into the team. Optionally the team may include graphic artist, those who are well versed with animation, graphics, power point slides or other computer aided learning material preparation.

The team lead by subject matter expert would have the following roles / responsibilities:

- Propose courses in accordance with the prevailing curriculum for UG level or for skill or vocational training after conducting relevance and need analysis.
- Define the level (basic / advanced etc.), entry level requirement(s), duration, number of teaching modules and their mapping.
- The proposal should also contain measurable objectives and learning outcomes, assessment and evaluation strategies, course outline etc.
- The subject matter expert would be responsible for preparing the course within the time limit to make it possible to undertake the production and editing related activities so that delivery of the course could be made within the stipulated time.
- The academic team is expected to conduct post production review to ensure the quality of the content and production.
- The subject matter expert should also ensure the content is free from plagiarism and copyright issues. Wherever, permission is required to reproduce the externally sourced content, permissions are obtained prior to inclusion of such content. Wherever necessary, annotations and citations are to be incorporated in the accepted format for externally sourced material.
- Subject matter expert / team should also carry out necessary corrections as determined by the academic coordinators or the peer review team from CEC.
- CEC would retain the copyright to the video, text materials and all other deliverables.

3.1 Content Writer/Subject Matter Expert selected by the PI is required to provide the following details about him / herself prior to offering his / her services as content writer:

- a) Personal Details: Name(s), Designation, Organization, Brief Biography, Contacts, Mobile, e-mail ID, etc.
- b) Transfer the copyright to the CEC/NME-ICT/MHRD as may be required.
- c) Submit after ensuring that content is original and are not plagiarized. Content Writer/ Subject Expert delivering the

lecture(s), text, diagram(s), Chart(s) etc., should submit an undertaking in writing to the CEC that he/she has not violated the Copyright issues on content provide by him / her.

- 3.2 Content Writer/Subject Matter Expert should provide the content in four quadrant model.
- 3.3 **Quadrant-I (e-Text):** Content Writer is expected to write detailed write-up on the topic of module as per content structure. The textual description should also be enriched with multimedia supplements, wherever applicable. Multimedia supplements may include images, animations, graphics, video or audio clips, line drawings, hand drawings whichever applicable/possible. For each topic or subtopic, Content Writer should use examples to explain the module, if required. (Quadrant-I is explained at point 4.1).
- 3.4 **Quadrant-II (Self-Learning):** In this quadrant, Content Writer is expected to provide video tutorial which will explain the topic of the module. The tutorial may also include Multimedia, Animation, Documentary, Simulation, Virtual Lab, etc. (Quadrant-II details are given at point 4.2).
- 3.5 **Quadrant-III (Learn More / Source for Further reading / Web Resources):** This quadrant contains supplementary material of the topic of the module in different forms like other related reading materials, source of further reading (such as books, articles etc.) and links to websites dealing with the topic etc. (See 4.3 for Quadrant-III details).
- 3.6 **Quadrant-IV (Self- Assessment /Evaluation):** Content Writer should provide minimum 10-15 questions for each module in Multiple Choice Questions with Answer or True & False Statements. (For more on Quadrant-IV, see 4.4).
- 3.7 Make necessary changes and enhancement in the content as suggested by the reviewer.
- 3.8 Submit final version of the content to the PI.

4. e-Content Module

An e-content module has following elements:

Home

a. Objectives

- b. Subject Mapping
- c. Summary
- d. Text
 - 1. Case studies
 - 2. FAQ's
- e. Video and audio
- f. Assignments
 - 1. Quiz
 - 2. Tutorial
- g. References
 - 1. Glossary
 - 2. Links
- h. Download
- i. Contact

The Four Quadrants of e-content module:

4.1 Quadrant-I (e-Text):

Text should consist of at least 8 pages or minimum 3000 words with detailed write-up on the topic of module in the .rtf/.doc/.odt format. The number of words/pages must be sufficient to make the narrative of the topic clear such that independent learning is also possible. Language should be very simple. Topic should be presented in systematic and logical manner.

The module must consist of the following elements:

- Self-check exercises
- Examples & Applications from day to day life, if applicable
- Illustrations (Images, Maps, Graphics (2D & 3D))
- Appropriate URLs wherever required
- Latest Developments and Trends
- Summary

The textual description should also be enriched with multimedia supplements, wherever applicable / possible. Multimedia supplements may include images for which resolution should be about 600 dpi, animations, graphics, video or audio clips, line drawings, hand drawings.

Self-check exercises are problems with answers given to learners that allow them to assess how they are doing on an ongoing basis. Doing them online with self-grading provides immediate feedback. Self-check exercises are to be built in the body of the text.

Applications from day to day life, if applicable should be incorporated. For each topic or subtopic, Content Writer should use examples to explain the module, if required.

The summary will help a learner to quickly review of the module.

Text Format: The text may be divided into sections, subsections and, where necessary, sub-subsections.

- a) **Fonts:** Format the text using a “Times New Roman” or “Arial” font (size 11). Maintain uniform font size and style through-out the text with single line spacing. Assign sequential page numbers to the module.
- b) **Formatting Sections, Subsections and Sub-subsections:** The first section should state clearly the objective of the work, its scope and the main advances reported, with brief references to relevant work.
- c) **Style, Spacing and Numbering:** The preferred format for numbering the sections 1.,2.,3., in Times New Roman Bold. The subsection should be numbered as 2.1.,2.2.,2.3., in Times New Roman Italics and the sub subsection should be numbered as 2.3.1.,2.3.2., in Time New Roman Italics.

4.2 Quadrant-II (Self-Learning - Audio/Video)

Content delivery through Video to explain the topic is an essential component (self-learning) of each module of the e-Content. It may include Multimedia, Animation, Documentary, Simulation, Virtual Lab, etc as may be appropriate.

The Video must not be like a spoken tutorial (audio narration / voice-over of text mention in presentation slides). A clear visual description as well as text is required. Training demonstration, illustration of examples, case study, documentary, etc should be added wherever applicable / possible.

It is possible that a content writer / domain expert is not fully acquainted with art of creating multimedia / graphics. In such cases, content writer should describe his / her multimedia requirement using a story board.

The duration of Video should be 30 Minutes.

Video tutorial explains the topic of a module. It should be initiated by the content writer / expert. The writer / expert may appear in the video, generally, not less than 25% of the time. Rest of the time which may include in-between sections or sub-sections, or during display of graphics,

animations, PPTs and other relevant visuals video timeline may carry writer/expert's voice.

The expert/writer whose video is being recorded should look straight into the lens and talk to the camera.

The format of video must be MPEG4.

The quality of video should 720x576 (pixel), 25 (frame/second), 450 (TVL resolution), 450 Mbps for incorporation in the template.

The audio has to be clear and of superior quality. Ensure that there is no distracting background noise. The equipment used should be professional one.

Presentation: The presentation may be a part of video. The format for presentation would be PPT (PowerPoint Presentation program). During preparation of presentation:

- Avoid using long blocks of text.
- Use preferably bulleted points.
- Use fonts like Arial, Verdana, Helvetica or Myriad pro etc.
- Use font size not less than 20 for clear visibility.
- Add graphics and images as much as possible appropriately.

4.3 Quadrant-III - (Learn More / Web Resources / Supplementary Materials):

Learn more quadrant is about the supplementary material of respective modules in different forms. These may be in the form of:

- Books, articles, research papers, journals, case studies etc.
- Links to web sites giving additional readings, Wikipedia, blogs, open source content etc.
- Glossary.

4.4 Quadrant-IV - (Self-Assessment)

For Self-Assessment, The Content Writer / Expert should provide minimum 10-15 questions for each module in one or more of the following formats.

- i) Multiple Choice Questions with Answer
- ii) True & False Statements

5. Checklist

- 5.1 Objectives
- 5.2 Summary
- 5.3 Main Content (Including Video Component)
- 5.4 Multimedia Contents (Images, Maps, Graphics, Video & audio clips, Animation, Simulation).
- 5.5 Separate Folders Containing Images, animations, etc
- 5.6 Assessment & Evaluation
- 5.7 Learn more/Supplementary Materials

6. Process, steps and role and responsibilities in development of e-content module

6.1 Subject Coordinator

- a) Adoption of UGC model curriculum for 3 year UG course.
- b) Subject Mapping -Overview on Papers/Topics/Modules(average 300 modules per subject)
- c) Identification of Subject Experts and allotment of Papers/Topics/Modules
- d) Vetting of Academic Script provided by Subject Expert.
- e) Review of Modules, Coordination with Subject Expert for the completion of assigned modules.

6.2 Subject Experts

- a) Participation in orientation workshops.
- b) Finalisation of Papers/Topics/Modules in consultation with subject coordinator.
- c) Preparation of Instructional design and strategies for e-content production.
- d) Providing module-wise Academic Script along with other elements of the e-template such as Module Mapping, Objectives, Summary, Downloadable Text, Case studies, FAQ's, Assignments, Quiz, Tutorial, References, Glossary, Web References etc.
- e) On camera presentation (Audio/Video recording).
- f) Be a Team member for Preview of Modules.

6.3 Producer/Production Assistant

- a) Brief the subject experts regarding various aspects of production.

- b) Develop audio/visual format of the academic scripts provided by the subject experts after verification by the Subject Coordinators.
- c) Incorporate illustrations such as Animation, Graphics, text slides and charts as per the requirement of the subject.
- d) Audio/Video Recording.
- e) Mastering of programme along with video editing.
- f) PDR and quality preview.
- g) Carry out amendment as suggested by CEC Expert/Preview team.

6.4 Studio Operation Team

- a) Studio recording of Video Programmes.
- b) Cameraman - Lighting and Camera operation.
- c) Technical Assistant - Video switching, Audio Mixing, Studio preparedness and Technical support during recording.
- d) Technician - Lighting, Technical support, Audio/Video recording etc.

6.5 Animation/Graphics Artist

- a) Preparation of 2D/3D animation, graphics, bars, charts as required by producer.
- b) Digitization of models, pictures, graphs, charts, maps and other elements provided by subject expert.

6.6 Editors

- a) Editing of the video programme with proper visualization as per requirement of the content.
- b) Down conversion of the video programme from 50/25 Mbps to 250-450 Kbps and chunking in 5-7 minutes segments for e-contents.

6.7 Assistant Computer Programmer (Flash Integration)

- a) Project based integration of various elements of the e-content template.
- b) Validation on multiple platforms for compatibility.
- c) Recording on DVD/Hard Disk.

6.8 Quality Assurance Team

Members:-

Producer/ Director of the Media Centre,
Coordinator/Subject Exert,

One Subject Expert other than content developer.

Responsibilities:-

Preview, Quality Assurance and Certification.

Transfer of e-content module to CEC.

6.9 The CEC team

a) PI and Co-PI's:-

- Co-ordination and monitoring by PI and Co-PI.
- Monitoring of programme through monthly and quarterly progress reports.

b) Library:-

- Receipt of deliverables by CEC Library.
- Meta-tagging of e-content/ETV programme along with Multimedia Unit.

c) Software Unit:-

- 2nd stage preview of video elements.
- Minor correction at CEC. Returning back to Media Centres for any major correction /reproduction if rejected.
- Final acceptance/ certification and validation by software unit.

d) Multimedia:-

- Meta-tagging of e-content/ETV programme
- Uploading on web portals.

7. Time-Frame for e-Content Development—One Module

7.1 Pre-production Stage:-

7.1.1 Orientation of subject expert by organising workshops at CEC/Media Centres. (24 Hrs. / Days)

7.1.2 Providing module wise Academic Script along with other elements of the e-template like Module Mapping, Objectives, Summary, Downloadable Text, Case studies, FAQ's, Assignments, Quiz, Tutorial, References, Glossary, Web References etc. (16 Hrs)

(Assumes that the Resource Persons will devote at least 4 hours each day, besides his/her normal academic work.

7.2 Production Stage:-

(Assuming that each module is of 25-30 minutes' duration)

<u>Item</u>	<u>Days</u>	<u>Hours</u>
1. Basic briefing of the subject Expert regarding Orientation for e-content development	½	4
2. Studio set-up & Audio/Video Recording	½	4
3. Preparation of animation/graphic/Digitisation	2	16
4. Post-production-video Programme***	2	16
5. Preview, correction & certification of Video programme	¼	2
6. Recording video programme on Final Media	¼	2
7. Down-converting and Chunking	½	4
8. E-content integration in template and Platform validation	2	16
8. Preview, correction & certification of e-content	½	4
TOTAL	8 ½	68

8. Content Development

8.1 Storyboard

8.1.1. The storyboard should be based on the Curriculum Specification of the related subject and should use the mapping, content script etc.

8.1.2. The storyboard should be based on Sharable Content Object Reference Model (SCORM).

8.1.3. The storyboard should conform to the Instructional Design Standards.

8.1.4. Layout

- a) The screen layout should portray the courseware to be developed.
- b) The storyboard should include:
 - i. Title and version as the header
 - ii. Page number as the footer
 - iii. Category / illustrations
 - iv. Voice over Script.
 - v. Text Script
 - vi. Descriptions of media objects

8.2 Instructional Design

- 8.2.1 Each lesson should be matched to one or more learning outcomes in the Curriculum Specifications.
- 8.2.2 The introduction section should give a short overview of the lesson and acts as a set induction to motivate the learners to the lesson.
- 8.2.3 The Content / Concept / Skill Learning section should be based on learning theories that will enable learners to master the concept. Explanations should be kept to the minimum; however, should more information be required an option should be made available. Activities that elicit responses from learners should be used as much as possible to engage them to learn. In this respect, the approach should always be that learner should be guided to discover or construct the concept or skill.
- 8.2.4 The Practice / Activity section should contain guided exercises. These exercises should elicit responses from learner as much as possible and not merely show animated explanation.
- 8.2.5 The Test / Evaluation section should have the following features:
- a) It should contain a variety of question types, including but not limited to multiple choice, matching, drag and drop or fill in the working / answers.
 - b) The questions should be chosen randomly generated by the system.
 - c) Templates for worded questions should not be reused.

8.3 Audio Standards

There are three types of videos - Narration or Voice-Over (VO), Music/Speech (M) and Sound Effects (SFX). Specify the types of audio to be used. Specify the kinds of music and sound effects required. If voice over is to be used, prepare the script of the voice and write it on the module. It may be noted that the chunk text would be delivered as audio.

- 8.3.1 Voice over should be synchronized with text, video, animation or graphic.
- 8.3.2 Voice Over used must be appropriate according to gender and age of the character portrayed.

- 8.3.3 The voice talent used should be appropriate to the characters appear in the learning object.
- 8.3.4 Volume, tone and pitch of audio should be consistent and clear though-out the learning object. It should not be peaky, shrill, tinny, bloomy, muddy, thin, distorted, scratchy, coarse, grainy, harsh, hiss, crackle or rustle.
- 8.3.5 Pronunciation must be correct and intonation must be clear and with neutral ethnic accent.
- 8.3.6 Language used should be linguistically correct, relevant to the subject and appropriate for the target group.
- 8.3.7 Standard British English should be used.
- 8.3.8 Background music used should adhere to the copy right act.
- 8.3.9 Sound effects should be relevant to the content.
- 8.3.10 No overlapping of the audio.
- 8.3.11 Short sentences should be used wherever possible and appropriate.
- 8.3.12 The voice-over should tell only what is relevant.
- 8.3.13 Short and simple audio script should be used.

8.4 Video Standards

A brief description of the video content is to be included. The video should be of following standards:

- a) Duration: 25 - 30 minutes
- b) Format: CCIR, PAL-B, 720 x 576 pixels
- c) High resolutions files @ 25 Mbps
- d) Low resolution files compressed at 500 Kbps on MP4 file format

8.5 Image/Graphics (2D & 3D) Standards

The Content Writer may provide a hand drawn image or a reference to an image available publicly on the web that needs to be modified. Otherwise he/she may also give a brief description of the image to be developed

through out-sourcing services.

8.5.1 Graphics should be logical and not contradictory to real life situations. (Example: showing shadow of an object).

8.5.2 Graphics should enhance and support learning.

8.5.3 Graphics or animation can be used to highlight key information.

8.5.4 Bias or stereotypes in graphics or animations (gender, ethnicity, religion, etc.) must be avoided.

8.5.5 Lines in diagrams / graphics should be straight, neat and the choice of thickness should be suitable to the graphic.

8.5.6 Diagrams should be in proportion to actual size.

8.5.8 Labels:

a) All diagrams should be neatly labeled.

b) Dashed lines, when used, should begin and end with a dash that intersects with the relevant points.

8.5.9 Format for Images (Graphics):

- In order to obtain high quality output, image resolution should be 600 dpi at the actual finished size. Ensure to embed images or supply linked image files.
- Number the illustrations / Figure/ Graphic/ Map/ Table according to their sequence in the text.
- Submit each figure as a separate file.
- For easy identification of source files in terms of figure numbers and format used, ensure that the name of file should contain figure number as well as format type, for example:
 - file name Fig1.TIFF means Figure 1 in TIFF Format
 - Fig 2.EPS means Figure 4 in EPS Format
- Provide captions to the illustrations separately. A caption should comprise of a brief title (not on the figure itself) and a description of the illustration. Keep text in the illustrations to a minimum but explain all symbols and abbreviations used. Figure captions should be understandable without reference to the main text.

- Convert figure or save as the image file in following formats:

EPS: Vector drawings. Embed the font or save the text as 'graphics'.

TIFF: Color or grayscale photographs (halftones): always use a minimum of 300 dpi.

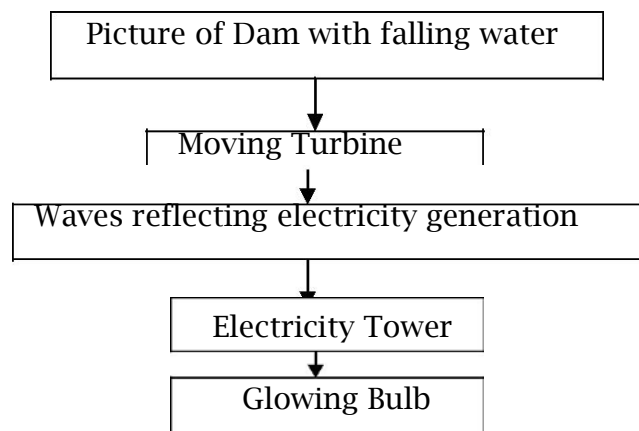
TIFF: Bitmapped line drawings: use a minimum of 1000 dpi.

TIFF: Combinations bitmapped line/half-tone (color or grayscale): a minimum of 500 dpi is required.

8.6 Animation - 2D & 3D Standards

Explain the nature and purpose of animation in the module with specific movements (fade in, fade out; zoom in, zoom out, etc.) of different elements or flow charts describing the process.

Example: Generation of Hydroelectricity



8.6.1 Animations used should be rendered as smooth as possible.

8.6.2 Blinking texts: Colour of the blinks should be contrasting.

8.6.3 Animation should be related to content and must be accurate.

8.6.4 Animation should be used with purpose to support and enhance learning.

8.7 Simulation

Simulation is the imitation of the operation of a real-world process or system over time. The act of simulating first requires that a model be developed that represents the key characteristics or behaviors of the selected physical or abstract system or process. The model represents the system itself, whereas the simulation represents the operation of the system over time. Good simulations provide the maximum level of interactivity as they allow the user to explore a concept, process, relationship, etc. by changing input parameters and watching the outcome in a graphical representation. A computer simulation is an attempt to model a real-life or hypothetical situation on a computer so that it can be studied to see how the system works. By changing variables in the simulation, predictions may be made about the behavior of the system. It is a tool to virtually investigate the behavior of the system under study.

8.8 Technical Standards

8.8.1 The learning object should run efficiently in the following minimum environments:

- a) Internet Explorer 5.5, Netscape 7.0, Mozilla 4.0, Firefox 1.5, Safari 1.2 and Opera 6.
- b) Windows 98Se, Macintosh OS X or Linux SUSE 9/Linux Red Hat 9operating system.

8.8.2 Loading time between pages should be seamless.

8.8.3 Programming Approach should be flexible.

8.9 Display Standards

8.9.1 In designing colours for the display, there should be a contrast between the foreground and the background.

8.9.2 Text Display

8.9.3 Fonts:

- a) Colours used for text should be prominently visible against the background of the screen.
- b) Consistent text size should be maintained throughout.

8.9.4 Presentation:

- a) Text should be positioned accordingly. The amount of text on screen should be optimized to avoid clutter.

- b) Blocks of information should be separated by sufficient space.
- c) Use margins, alignment, and spacing to emphasise important points.
- d) A pop-up screen containing explanations/calculations should only appear on demand basis to avoid cluttering on screen (example: “Mouse over” the appropriate area should be used).
- e) Highlighting effects should be used sparingly/occasionally to maintain emphasis.

9. Curriculum and Pedagogical Standards

- 9.1 All content should conform to the UGC Model Curriculum Standards.
- 9.2 The learning object conforms to the curriculum in terms of its aims, learning outcomes, objectives, skills and values.
- 9.3 The learning object promotes the acquisition of knowledge: content, problem solving, epistemic and inquiry knowledge.
- 9.4 The learning object should always depict local life or culture. It can also depict international life or culture as long as it does not contradict local life or culture. Local life or culture depicted in the learning object must observe sensitivity issues of various ethnic groups in the country.
- 9.5 The learning object permits self-paced, self-accessed and self-directed learning.
- 9.6 The content should follow a clear learning strategy to achieve learning.
- 9.7 The content should be accurate, valid, up-to-date and without errors.
- 9.8 The learning object should stimulate and motivate the learner.

10. Content Deliverables

10.1 Deliverables to CEC:-

10.1.1 Video programmes (25- 30 min. duration)

- a) High resolutions files @ 25 Mbps on optical disc
- b) Low resolution files compressed at 500 Kbps on MP4 file format

10.1.2 E-content with all elements embedded in the template.

10.1.3 LoRs (maximum up to 2 min. duration).

10.2 To be retained at Media Centres (Files to be retained at Media Centres for development of MOOCs/online courses and for archival of content):

10.2.1 A copy of all the items delivered to CEC as listed at 10.1.1 to 10.1.3 above.

10.2.2 Text files - Objectives, Summary, Text (Case Study and FAQs), Assignment (Quiz & Tutorials), Reference (Glossary and Links) etc. - in MS Word (.doc/.docx).

10.2.3 Downloads/E-books - PDF file formats.