



Research Theory and Methodology^{a b}

SYLLABUS 2019-2020^{c d}

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1 Description

The unit covers concepts, methods, and techniques for designing and implementing scientific work with rigorous procedure and content. Skill development is geared towards quality (e.g. research procedure, document structure, argumentation).

2 Teaching and Assessment

MODE Interactive classes with students as researchers in training (*ActiveLearning*TM); focussed and applied learning (*CaseProject*TM); live editing, upon request (*LiveRevisions*TM)

ASSIGNMENTS — v. § 3

CRITERIA Traceability, objectivity, precision, accuracy (Perdicoulis, 2012b)

FINAL SCORE = $\left(\sum_{n=1}^2 S_i \cdot W_i\right) \times 20$ [S_i = score of each assignment; $S_{i(max)} = \frac{4}{4}$; $W_i = 0.5$]

^a *Teoria e Metodologia de Investigação* — Informática, 3º ciclo, 1º ano

^b Syllabus and classes in English, accommodating an international audience

^c First edition: 2013-2014; last update: 2019-09-19 12:33

^d Support workshops (v. § 5) with Vasco Amorim, Assistant Professor, ECT, UTAD

3 Documents¹

3.1 Assignment 1

TITLE Annotated bibliography on the subject of the thesis

APPLICABILITY Thesis subject

FORMAT 2 to 4 pages A4, printed

DELIVERY ECT secretariat (Eng. I), one week after the conclusion of the classes

3.2 Assignment 2

TITLE The tasks of the research process and respective methods

APPLICABILITY Thesis project

FORMAT 2 to 4 pages A4, printed

DELIVERY ECT secretariat (Eng. I), one week after the conclusion of the classes

4 Support Software

4.1 Bibliography Management

ENDNOTE (multi-OS)

PAPERS (macOS)

ZOTERO (multi-OS)

MENDELAY (multi-OS)

BIBDESK/ L^AT_EX (macOS) [code]

BIBT_EX/ L^AT_EX (multi-OS) [code]

4.2 Project Management

PROJECT (Windows)

OMNIPLAN (macOS)

GANTTPROJET (multi-OS)

PGFGANTT/ L^AT_EX (multi-OS) [code]

4.3 Diagram Preparation

GRAPHVIZ (multi-OS) auto-layout [code]

CONCEPTS (iOS) manual drawings in vector format

OMNIGRAFFLE (macOS) WYSIWYG, auto-layout

VISIO (Windows) WYSIWYG

LIBREOFFICE DRAW (multi-OS) WYSIWYG

TIKZ/ L^AT_EX (multi-OS) [code]

4.4 Document Preparation

L^AT_EX — v. Templates (Perdicoulis, 2011, 2013f,g, 2014d, 2015b,c)

¹ General guidance: v. Perdicoulis, 2012b, 2014b,c; support software: v. § 4.4

5 Programme

- S01 Introduction [Folios: *Research, Science, Documents*]
 - I *Presentation*: Syllabus; feedback
 - II *Cognitive base*: Data, information, comprehension, knowledge
 - III *Sources and formats*: Articles, books, reports, dissertations/ theses, internet, people
 - VI *Techniques*: Searching for publications; bibliography management software
 - V *Techniques*: Consulting, annotating, citing, and referencing publications; class notes

- S02 Preparation [Folios: *Metadata, Cataloguing, Domains, Problems*]
 - I *Perspective*: Science domains; ‘subject matter’; motivation; the ‘scientific question’
 - II *Methodology*: Approaching the subject matter; work protocol; research typology
 - III *Perspective*: Qualitative vs. quantitative science; suitability to subject matters
 - IV *Competence*: Argumentation — construction, communication, interpretation, verification
 - V *Competence*: Appropriate (‘scientific’) writing — structure, style, content, feedback

- S03 Work [Folios: *Search, References, Research, Science, Reports, Assessment, Ailments*]
 - I *Perspective*: Scientific revolutions; historic developments
 - II *Competence*: Research workflow; scientific rigour
 - III *Competence*: Induction; explanation; formulation of a hypothesis
 - IV *Competence*: Hypothesis testing; experimentation
 - V *Competence*: Deduction; conclusions; decision

- S04 Refinement [Folios: *Research, Invention, Science, Domains, Learning, Cause*]
 - I *Perspective*: Scientific method; engineering protocols
 - II *Perspective*: Evidence and data; direct or indirect acquisition
 - III *Perspective*: Beyond data and information: understanding and knowledge
 - IV *Perspective*: Personal experience; working in the ‘medium’; people; bibliography
 - V *Perspective*: Other fields; the same concepts in other contexts; parallelism

- S05 Support workshop
- S06 Support workshop

References and Further Reading

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Sobel, M.E. (1994) Causal inference in the social and behavioral sciences. In: G. Arminger, C.C. Clogg, and M.E. Sobel [Eds.] *Handbook of Statistical Modeling for the Social and Behavioral Sciences*. New York: Plenum Press.

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- March, J.G. (1994) *A Primer on Decision Making: How Decisions Happen*. New York: The Free Press.
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- Perdicoulis, A. (2014a) Curators of scientific publications. *oestros*, **18**.
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- Perdicoulis, A. (2013b) People know. *oestros*, **8**.
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- Perdicoulis, A. (2012c) Recreating established systems. *Systems Planner*, **10**.
- Perdicoulis, A. (2012b) Scientific writing. *oestros*, **5**.
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- Munroe, R. (2013) How much science is there? *Science*, **342**:58–59.
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— Templates —

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- Perdicoulis, A. (2014d) *PhD thesis milestones: Gantt chart starter file*. Perdicoulis Publishing: Software Division, Training Collection. [Assignment 2]
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- Perdicoulis, A. (2013f) *Annotated bibliography: text file*. Perdicoulis Publishing: Software Division, Training Collection. [Assignment 1]
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