Header-Body Checks

# Overview

There are two limits that can be specified in the header part of a Scribe Block: MaxCredits and MaxClasses. These limits tell how many classes and/or credits can be applied to satisfying the requirements given in the body (rules) part of this block. In addition to the number of credits and/or number of classes, each limit has an associated list of courses to which the limit applies. These course lists may include wildcards (@) for the subject and catalog numbers of the courses, and the catalog number can be given as a range (using a colon). Furthermore, there can be a list of courses that are exempt from the limit, specified with the keyword *except*. Finally, each course can be subject to a “with-restriction” that specifies properties that govern the applicability of the limit.

In this report, the terms “course list” and “course set” are used somewhat interchangeably. The distinction is simply that a set is a list that has been filtered to ensure that it contains no duplicates.

## Examples

## MaxClasses 3 in PHYS 2@

## MaxCredits 4.5 in @ (With DWTransfer = Y) except PHYS 200:299

No more than three 200-level Physics courses[[1]](#footnote-1) may be used to satisfy the requirements in this block.

No more than 4.5 credits in any course having the *DWTransfer* property with the value “Y” may count towards the block’s requirements, but this limit does not apply to 200-level Physics courses.

# The Question

How important is it to show these limits when displaying the block’s requirements?

There are at least two cases where they can safely be ignored:

1. The courses listed are mutually exclusive anyway. There are three sub-cases:
   1. Two courses may be “cross-listed.” In PeopleSoft, a single course can be offered with different subjects and/or catalog numbers (same course-id but different offer-numbers). Students can’t get credit for taking the two different versions.
   2. Courses may be part of an equivalence group. Here, students can’t get credit for taking more than one course within the group.
   3. Inactive courses can be replaced by equivalent new courses. Students who took the now-inactive version are not allowed to register for the new version.[[2]](#footnote-2)
2. The limits specified in the header may be redundant to restrictions present in the body.

# Methodology

The parse tree for each Scribe Block is saved in JSON format as two lists of dictionaries, one for the header and one for the body. The *course\_mapper* application traverses these two lists to generate three tables: one (“programs”) that summarizes the block’s metadata and header information; a second one (“requirements”) that identifies requirements from the body that have associated sets of courses; and the third one (“mappings”) that maps {course-id, offer-number} tuples to rows in the requirements table.

The *programs* table includes columns for earned-grade and transfer limits that apply to all the requirements specified in the body of the block. At the present time, the *programs* table has been augmented with an “Other” column that contains lists of any *MaxCredits* and *MaxClasses* limits for the program block.

For this analysis, an application called *header\_body\_check* determines what intersections exist between course sets in header MaxCredits/MaxClasses entries (“limit sets”) and course sets found in the requirements for the block (“requirement sets”). That is, it looks for cases where the limits in the header are potentially redundant to the requirements specified in the body of a block. This redundancy is “potential” because *header\_body\_check* ignores with-expressions in constructing both sets. The with-expressions are collected and handled separately, as described below. The app builds course sets by finding the subject and catalog number for all active courses that match *scribed* course lists after expanding wildcards and number ranges, and after deleting courses in each *except* list from their associated scribed lists[[3]](#footnote-3).

The *header\_body\_check* application generates a report that shows, for all MaxCredits and MaxClasses course sets found in a Scribe Block, one of four types of information:

1. Whether all the active courses listed for the limit are cross-listed
2. Whether all the active courses listed for the limit are part of a single equivalence group
3. Whether there are no active courses for the limit
4. An analysis of how the set of courses specified in the limit overlaps with the sets of courses found by the *course\_mapper* application in the various requirements from the body of the block.

The *header\_body\_check* report has a line for every requirement that has any courses overlapping with any courses listed in a *MaxCredits* or *MaxClasses* clause in the block’s header. A script generates a spreadsheet from the *header\_body\_check* report.The spreadsheet shows how many times various patterns of limit/requirement overlaps occur across all the Scribe Blocks examined. These are the columns in the spreadsheet:

* *Count*: How often this pattern was found
* *Limit*: The numerical limit specified in the header
* *Type*: Whether the limit is the number of classes or the number of credits
* *Courses*: How many active courses are in the header limit set
* *Overlap*: How many courses in a requirement’s course set overlap with the courses in the header limit set
* *Alternatives*: How many active courses are in the requirement’s course set

# Results

There were 2,863 *MaxClasses* or *MaxCredits* limit clauses, occurring in 541 different Scribe Blocks: 1,476 majors, 930 concentrations, 350 minors, and 107 others. (Degree blocks were not examined.)

## With-Expressions

Appendix I gives the frequencies with which with-expressions are attached to courses listed in MaxClasses or MaxCredits limits in the header, and Appendix II gives the frequencies with which with-expressions are attached to courses listed in the requirements specified in Scribe Block Bodies. Transfer limits account for 88% of the cases in the header. (95% if no with-expression cases are counted). In the Scribe Block bodies, there is no with-expression in 85% of the cases. Where there *is* a with-expression, there are just 127 cases where the expression refers to transfer courses (“With DWResident = N”).

## Limit Patterns

[The spreadsheet](header_body_summary.csv) generated from the *header\_body\_check* report shows 300 different patterns that were found, only 14 of which occurred more than ten times. Taking the first case as an example, there were 50 cases where a *MaxClasses* limit of zero out of 4,303 possible courses is allowed. In these 50 cases there was one required course (in a list with just one course alternative) where the required course was one of the 4,303 courses specified in the limit.

# Answering The Question

The results so far indicate the extent of the issue for T-Rex: there are enough restrictions on applying transfer restrictions on course requirements that we can’t safely ignore them. We *could* simply present the requirements where there are no transfer restrictions and show others as “unavailable.” But a deeper analysis should reduce the number of “unavailable” cases appreciably. The deeper analysis requires looking at the Scribe Blocks involved. This task is more tractable than it might seem. For example, the first row of the summary spreadsheet involves just two different Scribe Blocks, both for programs at Lehman.

There are 216 unique Scribe Blocks that cover the 300 observed patterns. Here’s a manual analysis of the 14 most common patterns.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Count** | **Pattern** | **Blocks** | **Colleges** | **Analysis** |
| 50 | 0-class-4303-1-1 | 2 | LEH | DWResident=Y |
| 44 | 9-credit-107-1-1 | 6 | NCC | DWTransfer=Y |
| 23 | 10-credit-10685-1-1 | 3 | CTY | DWTransfer=Y, but redundant to total-credits minus MinRes |
| 23 | 1-class-2-2-2 | 11 | BAR, BCC, HTR, YRK | BAR: two pairs of same or similar courses  BCC: two pairs of dissimilar marketing courses  HTR: A pair of similar courses, repeated in eight blocks  YRK: A pair of geometry courses |
| 21 | 6-credit-10685-1-1 | 12 | CTY | Same as 10-credit-10685-1-1 |
| 21 | 29-credit-875-1-1 | 1 | MEC | General limit for undeclared majors |
| 20 | 1-class-2-2-42 | 1 | HTR | Should be equivalence groups. (LATIN 1+2 = LATIN 7) |
| 16 | 0-class-4303-2-2 | 2 | LEH | Same as 0-class-4303-1-1 |
| 15 | 11-credit-10685-1-1 | 2 | CTY | Same as 10-credit-10685-1-1 |
| 14 | 1-credit-16-1-1 | 1 | KCC | DWGrade < C |
| 14 | 1-class-2-0-13 | 6 | HTR | Same as 1-class-2-2-2 |
| 13 | 9-credit-107-2-2 | 5 | NCC | Same as 9-credit-107-1-1 |
| 13 | 0-credit-3888-1-1 | 2 | CSI | DWPassFail=Y except covid |
| 11 | 7-credit-10685-1-1 | 4 | CTY | Same as 10-credit-10685-1-1 |

# Appendix I: With-expressions in header limits.

385,436 DWTransfer = Y

34,650 None

11,664 DWPassfail = Y

8,606 DWResident = Y and DWGrade < 1.7

16 DWgrade < C

6 DECIDE = LOWTERM

# Appendix II: With-expressions in rules.

430,112 None

22,916 (DWTERM <= 1189U)

5,319 (DWResident = Y)

2,585 (LIBARTS = LIBARTS)

2,506 (ATTRIBUTE = FISD)

2,506 (ATTRIBUTE = FISC)

2,506 (ATTRIBUTE = FISR)

2,503 (ATTRIBUTE = FUSR)

2,503 (ATTRIBUTE = FUSD)

2,503 (ATTRIBUTE = FUSC)

2,498 (ATTRIBUTE = FCED)

2,498 (ATTRIBUTE = FCEC)

2,498 (ATTRIBUTE = FCER)

2,481 (ATTRIBUTE = FWGC)

2,481 (ATTRIBUTE = FWGR)

2,481 (ATTRIBUTE = FWGD)

1,296 (DWCredits < 1)

1,272 (DWCREDITS > 3)

1,266 (ATTRIBUTE = FSWC)

1,266 (ATTRIBUTE = FSWD)

1,266 (ATTRIBUTE = FSWR)

1,221 (DWCredits >= 2)

962 (WRIT = W)

682 (ATTRIBUTE = CAPS)

565 (DWRESIDENT = Y)

420 (DWTERM <= 1099U)

384 (DWGRADE >= "2.0")

300 (DWGrade >= 2.0)

277 (DWTERM <= 1102U)

220 (DWPASSFAIL = Y AND DWPASSED = Y)

220 (DWcredits >= 4)

160 (DWCredits >= 4)

150 (DWTERM > 1209U)

133 (dwresident = y and dwgrade > 1.7)

132 (ATTRIBUTE = RECR)

132 (ATTRIBUTE = RCEC)

132 (ATTRIBUTE = RECC)

132 (ATTRIBUTE = RECD)

126 (DWTERM > 1219)

120 (DWTransferCourse = "ELECT (M)")

112 (DWRESIDENT = N)

94 (DWTERM < 1192U)

92 (DWTERM < 1079)

90 (DWTERM >= "1089U")

88 (DWCREDITS >= 3)

80 (DWCREDITS >= 4)

70 (DWTERM >= 1192U)

69 (WRIT = "W" , "I" , "Q")

64 (DWTransfer = "Y")

62 (DWTERM >= 1186)

57 (ATTRIBUTE = FCUS)

56 (ATTRIBUTE = FCCE)

54 (DWTERM = 1212U)

54 (ATTRIBUTE = RMQC)

54 (ATTRIBUTE = RMQD)

54 (ATTRIBUTE = RMQR)

54 (ATTRIBUTE = RCMQ)

50 (DWTERM = 1222U)

49 (ATTRIBUTE = FCIS)

45 (ATTRIBUTE = FCSW)

43 (DWTERM >= 1162)

39 (ATTRIBUTE = FCWG)

38 (DWTERM < 1139U)

37 (DWGradeLetter = "CRW")

37 (DWTERM >= 1209)

36 (DWTERM >= 1192)

34 (DWTERM = 1209U)

34 (DWTERM = 1219U)

30 (ATTRIBUTE = FCEC and DWTransfer = Y)

30 (ATTRIBUTE = FCED and DWTransfer = Y)

30 (ATTRIBUTE = FCER and DWTransfer = Y)

30 (DWTERM <= 0942U)

30 (DWTERM <= 1139U)

28 (dwterm < 1212U)

24 (DWterm < 1069)

20 (DWCREDITS <= 3)

20 (DWTERM >= 1212)

20 (DWTERM > 1986U)

18 (DWGRADE >= C)

14 (DWResident = N)

14 (DWTERM >= 1196)

13 (DWTERM >= 1222U)

12 (DWTerm >= 1182U)

11 (ATTRIBUTE = RLPR)

11 (DWTerm <= 1199U)

11 (DWTerm >= 1202U)

11 (DWTransfer = Y and DWGrade >= C)

11 (ATTRIBUTE = RLPD)

11 (ATTRIBUTE = RLPC)

11 (ATTRIBUTE = RCLP)

9 (DWGRADE >= 2.0)

8 (DWTERM < 1229)

8 (DWTerm < 1182U)

6 (DWTERM = 1216U)

6 (DWTERM = 1202U)

6 (DWGrade >= C)

6 (DWTERM >= 1182)

6 (DWTERM < 1142)

5 (DWTERM <= 1112U)

5 (DWTERM >= 1179)

4 (DWTERM < 1206)

4 (dwterm < 1139U)

4 (DWTERM >= 1109U)

4 (DWTERM > 1169U)

3 (DWTERM < "1032")

3 (DWgrade >= "2.0")

2 (DWTERM < 1199 AND DWRESIDENT = Y)

2 (DWTERM <= 1199)

2 (DWRESIDENT = Y AND DWTERM = 1202U)

2 (DWTERM >= 1169)

2 (DWTERM >= 1199U)

2 (DWTERM < 1219)

2 (DWTerm = 1142U , 1149U)

2 (DWTERM < 1162U)

2 (DWterm < 1102U)

1 (DWTerm < 1162U)

1 (dwcredits > 0)

1 (DWTERM > 1189U)

1 (dwgrade >= C)

1 (DWTERM < 1216)

1 (DWTERM >= 1219)

1 (DWTERM <= 1169U)

1 (DWresident = n)

1 (DWresident = y)

1 (DWResident = Y or DWTransfer = Y)

1 (DWGrade >= "C")

1 (DWCREDITS < 1)

1 (DWTERM <= 1172)

1 (DWTERM <= 1179U)

1 (DWSection = Q)

1 (DWTerm < 1209)

1 (DWTERM <= 1189)

1 (DWTERM <= 1222)

1 (DWTerm = 1199U)

1. Assuming all course numbers are three digits. The second line shows a safer way to specify this set of courses [↑](#footnote-ref-1)
2. The active and inactive versions have the same course-id and offer-number, but might have different subjects, catalog-numbers, titles… [↑](#footnote-ref-2)
3. Whereas the *course mapper* application ignores course lists that expand to all active courses at a college, the *header\_body\_check* application does include all active courses when building both the limit and requirement course sets. [↑](#footnote-ref-3)